Master's thesis

NTNU
Norwegian University of Science and Technology
Faculty of Architecture and Design
Department of Design

Daniel Fremming

Exposing planned obsolescence and changing consumer behaviour

An investigation into obsolescence in products and possible avenues

Master's thesis in Industrial Design
Supervisor: Trond Are Øritsland
January 2024

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Norwegian
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and Tecnology
(NTNU)

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Master Thesis
2024

Daniel
Fremming

Acknowledgements

Looking back, I am grateful for the congenial, but also interesting and insightful discussions I have had with my supervisor, Trond Are Øritsland, and for his assistance throughout this thesis. I would like to extend my thanks to the participants for my workshop.

Privacy Declaration

This thesis collects data primarily from online-literature. The part of the thesis which involves activities such as workshops and casual-unstructured interviews, collects data which cannot be used to track back to people, i.e. collected data does not contain any personal identifiable information such as name, age, gender etc. All participants were anonymous.

Appliance of AI

On the topic about using AI based on natural language models in aiding the writing process of this thesis, a chatbot service was used (ChatGPT (ver. 3.5)) for this purpose, though it was used minimally. The purpose for this activity was to clarify and elevate paragraphs I found difficult to formulate in a clear way.

NTNU

Fakultet for arkitektur og design
Institutt for design

Master's thesis for Daniel Fremming

Exposing planned obsolescence and changing consumer behaviour
Bevisstgjøre forbrukere om planlagt foreldelse og påvirke deres holdninger

Konsum- og atferdsendring med hensyn på den enkelte forbruker blir ofte fremstilt som den endelige løsningen på spørsmålet om hvordan vi som et samfunn skal få ned forbruket og kutte ned klimagassutslippene. Det er allerede kjent at økt forbruk gjenspeiler økt forurensning, men også en reduksjon i tilgjengelige råvarer og materialer, spesielt av de ikke-fornybare ressursene. To sentrale faktorer som vil bli behandlet er produkter og egenskaper hos disse som kan være med på å påvirke forbrukere til å beholde produktet lengre fremfor å erstatte dem. Det andre er eksterne krefter som har tilrettelagt for planlagt foreldelse og svikt i teknisk infrastruktur i produkter og opplyse om disse og eventuelle nåværende tiltak som skal være med på å motvirke dette.

Med denne oppgaven ønsker jeg å finne og utvikle metoder for å bevisstgjøre konsumenter om såkalt «planned obsolence» gjennom litteraturstudier og forsøk, for hvordan skal konsumenter stille seg til foreldelsen av produkter når disse produktene gjennom en årrekke har blitt systematisk utviklet og planlagt fra produsentenes side? Med dette i bakhodet ønsker jeg å gjøre forbrukere mer bevisste over kjøp de er i ferd med å gjennomføre ved å ta i bruk tidligere innsikt til hva som gjør produkter og gjenstander mer beholdbare, til å lage narrativer, danne kritiske spørsmål hos forbrukere under innkjøp eller påminne dem om systemet som tillater svikt i produktene vi kjøper.

Proposed Activities:

- Generate insight on consumer behaviour and planned obsolescence, both historically and contemporary
- Translate insights into recommendations or tools for changing consumer behaviour
- Conduct user evaluation with measurement for nudging consumers
- Workshops

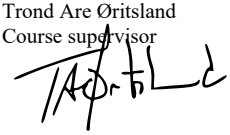
This thesis is carried out in accordance with «Retningslinjer for masteroppgaver i Industriell design".

Course supervisor (from ID): Trond Are Øritsland

Start: 12. januar 2024 Due date: 31. mai 2024

NTNU, Trondheim, (12.01.2024)

Trond Are Øritsland
Course supervisor



Marikken Høiseth
Acting head of department

Abstract

In the discussion about sustainability and climate change the reduction of our consumption and carbon footprint in the society is central. The reason for this is how consumption is intertwined with emission, where an increase of the first leads to an increase in emissions. Far too often, measures to cut carbon emissions are rooted in the change of individual behaviour, thus resulting in a decrease in consumption. For the last 100 years, consumers have been subjugated to planned obsolescence through the Phoebus cartel, and today, this takes the form of an institutionalization. Goods are pushed onto consumers with the promise of superseding an older product version, break down after the warranty is voided or suppress the right to repair.

Obsolescence goods have many facets and this thesis introduces two investigations to this particular topic. The first is a systemic design approach where the goal is to create an overview of obsolescence - the different versions of it, what are the implications and how some of the mechanisms might look like.

Secondly, I will scope it down to a level involving objects of everyday use. Here I will conduct a study of a selection of goods and try to repair them and address what type of obsolescence is affiliated with the respective object. The motivation is to highlight remedies for types of obsolescence and forward concepts related to how consumers can retain their objects longer, thus introducing slow products or the concept of product longevity through evocative design.

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Introduction

Motivation

The motivation for this project is to work with topics concerned with sustainability and the environment.

Central is the topic about consumer behaviour, consumption and consumer's relation to products, especially with regards to obsolescence and product longevity. With this in mind, the above topics serve as an utility for the purpose of investigating obsolescence in products which is the main idea behind this thesis.

The interpretation and use of the term obsolescence is imprecise and diverse, and is used interchangeably with the terms obsolete, outdated, outmoded to name a few (Mellal, 2020).

The term obsolescence is defined by Oxford English Dictionary as "*the process or fact of becoming obsolete or outdated, or of falling into disuse*" (Oxford English Dictionary, 2024).

From the perspective of consumer goods, this takes the form of a rapid phase out of possessed consumer goods. Discarded possession becomes a source of waste, where E-waste is mentioned to be the fastest growing solid waste in the world (World Health Organization, 2023). The problem of waste flows can be described through comparing the different agents of households: The average French household consumes 10 times more than a household in an underdeveloped country. Introducing an average American household, it is estimated to consume 30 times more than the French household, where the average American household possesses more than 100000 objects (Thunberg, 2022).

This unrestrained consumption has resulted in a throw-away culture and needs to be counteracted. In recent years, works about the phenomenon of emotional bonding between consumer and product have surfaced, which in turn can help remedy the increase of e-waste through making consumers grow attached to objects they are in possession of, hence retaining it longer. This in turn can help to turnaround the current and increasing problem with landfills and E-waste.

The culprits behind the accumulation of the waste are not only consumers and households, but also manufacturers and businesses through activities such as marketing and production of goods that eventually become obsolete. This demands a responsible consumption and production which abides by UNs 12th sustainable development goal (United Nations, 2023).

Responsible consumption and production

Figure 1: UN Sustainable Development Goals (United Nations, 2023)

Further Mentions

This thesis works as an extension to the research about products that are evocative and worthy of retaining. The phenomenon is described by Goosink, 2022 as "Keep-worthiness" (Goosink, 2020). This includes how consumers perceive value in a product in relation to personal values and interests. The superior goal as Carina Krøger describes it, is to prolong the lifetime of a product through activities that favor care-giving and maintenance of products, thus reducing the time between replacement or disposal of a product, consequently also contributing to a more sustainable consumption (Krøger, n.d.).

Scope

The work behind this thesis was conducted in the spring semester of 2024. It started out as an exploration of known resources - access to a collection of publications and master theses on the topic about Keep-worthiness was provided by my tutor. Here I got to know theses such as Goosink's about "Keep-worthiness" and Brøger about "Product Narratives" which acted as a starting point. In addition, the articles that were in the institute's archives gave a direction for further desk research. It is important to point out that the scope is not entirely defined in the preliminary parts of this thesis because I have not encountered the phenomenon of planned obsolescence before.

The design process can be divided into following phases:

- Insight
- Exploring design intervention
- Conceptual Framework

As the topic of planned obsolescence was barely mentioned in previous articles, this thesis pursues to investigate and systemize findings about obsolescence and investigate some of the attitudes towards the topic in the context of non-connected devices. Therefore, this thesis emphasizes on insight, but also proposes a design intervention in the last section. Initially, I was thinking about doing interviews and ask out fellow students about their consumer behavior through surveys, but I chose to omit such activities because of students, demographically, represent a group having lower purchasing power, when compared to other groups in a population, and hence lower consumption.

The general approach in this thesis is to look into literature and surveys pertaining to a bigger population.

Prologue

The topic about obsolescence evolved into being far more complex than I understood, and this is reflected in the redefinition of the search area from planned obsolescence to just being obsolescence. This is because the term obsolescence is diverse, which was revealed during the literature research. I was not aware of this to begin with - this has later shown that each variation of obsolescence has unique implications for products, consumers and the environment.

Search Field and Methods

From the literature research, it was revealed that obsolescence has different effects on different product categories. Taking into account the environment, the search field for this thesis is therefore narrowed down to the product category of non-connected electronic devices that generates E-waste. More on this in section 4 where the reader can find a definition of this thesis' product category.

Naturally, a starting point for the literature search was the resources made available through the institute's TEAMS drive. The shared resources drive present prior work concerned with mechanisms which are in favor for product longevity, but also scientific articles and newspaper articles. In addition to the earlier thesis', I used secondary literature, i.e. references mentioned in the thesis' to gather more samples, but also locate mentions about obsolescence in other places. These involved YouTube videos, books, news articles online and other websites. Considering the scientific articles and my approach to locate more samples, the most common search terms were: Obsolescence AND users OR consumers OR ENVIRONMENT OR SUSTAINABILITY.

Scope of Thesis

The activities in this thesis revolves around primarily research into design, but also research for design.

According to Sir Christopher Frayling, research into design involves research into different disciplines and perspectives and makes up the theoretical work of this thesis. Here I will investigate products and argue which categories I will focus on based on environmental implications, but also from the perspective of obsolescence and product longevity. Since the literature on these topics are so vast, I will be giving a brief rundown of each topic. These are presented in exclusive chapters with some overlap.

Secondly, Sir Frayling mentions research for art and design and involves gathering reference materials, which describes the primarily research I did.

This collection of reference materials is complemented by a creation of final product - an artifact where the "goal is not primarily communicable knowledge in the sense of verbal communication" (Frayling, 1994). I do not intend to embody the findings into a physical product, but rather derive key findings from the gathered resource material and present them, followed by a graphical label for the use on product packaging that I have designed - the intent is to inform customers about what products repairable.

Initial Research

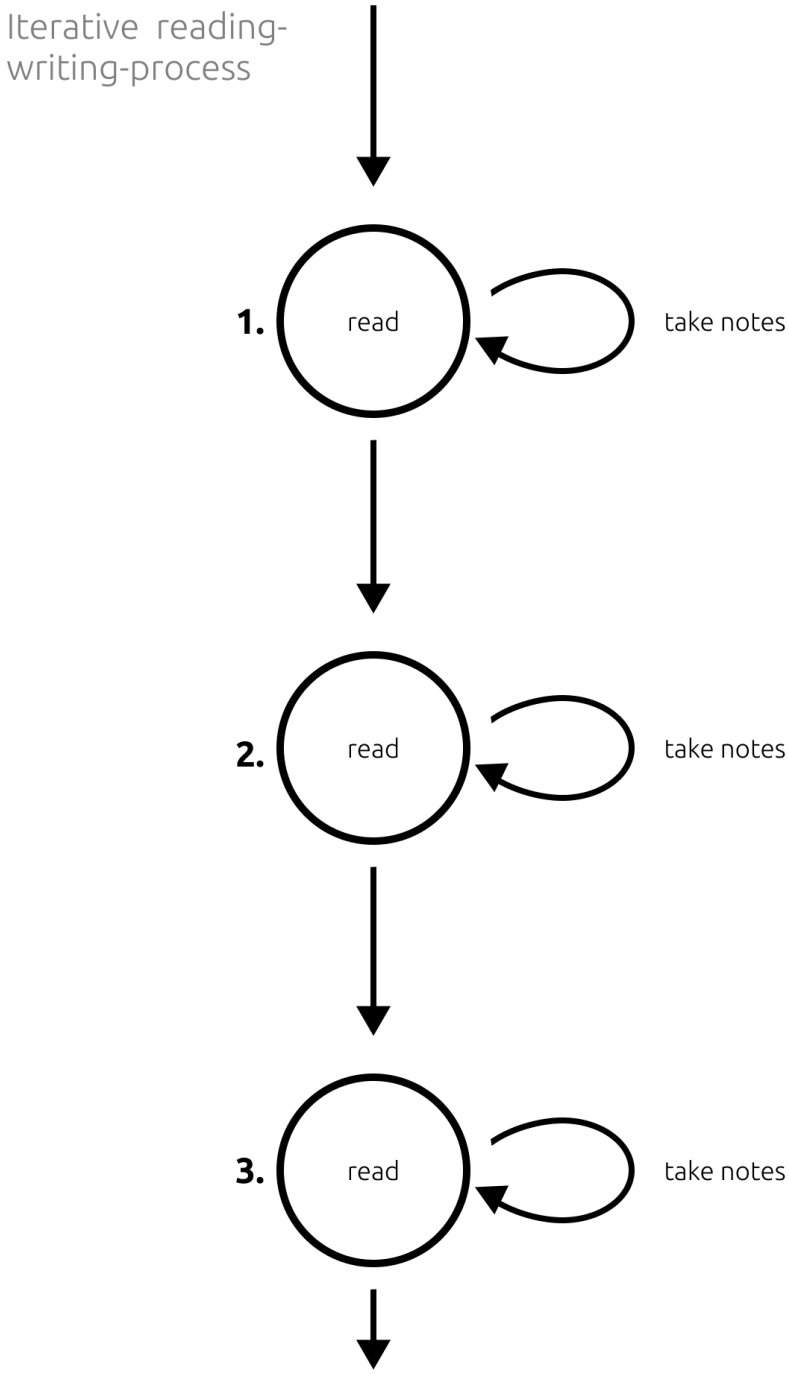
A research question acted as a guiding factor for the exploratory research (Martin & Hanington, 2019). As the terrain of the obsolescence was unknown to begin with, it helped me pick literature which was of relevance for the project. A starting point was the provided resource in Microsoft Teams/Keep-worthiness containing articles and previous projects on the topic about keep-worthiness in products. Goosink's work was found there. From here I kept diving, searching for more articles and literature about obsolescence and products. An initial question was:

"What is planned obsolescence and what are some of its implications?"

A natural first step was looking into Goosink's work since his works involves a framework for keeping products longer and see if there were any mentions about obsolescence. Here I found a definition of potential lifespan which could work as a start.

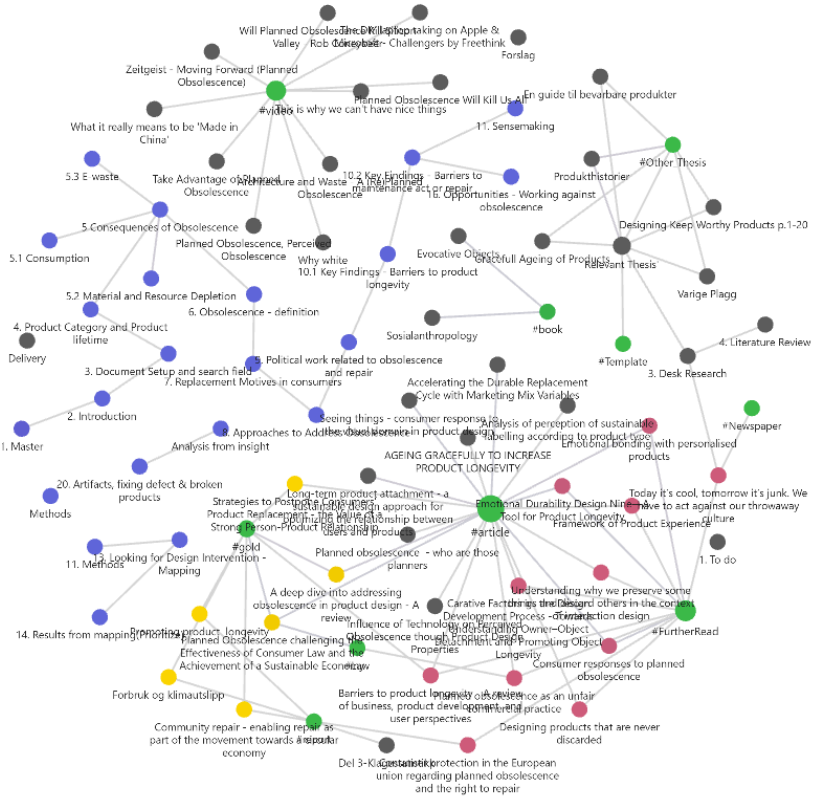
When defining graceful ageing, Goosink's mentions potential lifespan to be one of the components in products which allows graceful ageing (Goosink, 2020). This component describes how long a product lasts from intended use until breakdown.

Further, Goosink emphasizes that a broken product does not necessarily need to be discarded even though it no longer fulfills its intended function - the product can be "revived" through repair. The next step was to define a product category because this is closely related to potential lifespan and helps narrowing the search field. Some criteria for the product category were its environmental impact and which types of obsolescence belongs to it.


Iterative reading-writing-process
1.
read
take notes
2.
read
take notes
3.
read
take notes

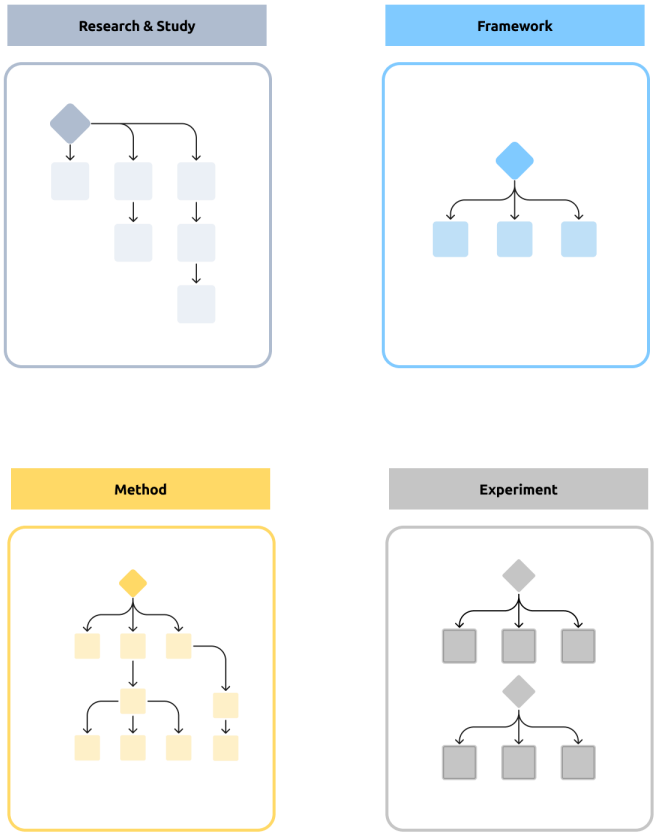
Keeping Track of Literature, Notes and More

Not only did I read I also took extensive notes of important information that I didn't want to leave out. To track and generate notes, Obsidian was used. Interesting about the program is how the files are ordered in graphs using #tags. The graph representation helped keeping track of notes and articles and their relevancy for the thesis and interconnectivity. After a while, it was even more difficult to take notes of every article and the graph subsided



Notes From Articles

Not did only the articles serve as fundament for the theory of this thesis. As the number of articles accumulated, I had to go through each and derive describing key words and descriptions of the article's content. For this purpose, Figma was used and acts as a database for the collection of articles giving an overview. See appendix A for more.



Insights from literature

Chapter Overview

Product category

The product category is characterized by appliances where mechanical or performance factors dominate the disposal decision. Secondly, the product category cannot have any software embedded into its design, since these types of products are regarded as more difficult to repair - one cannot simply replace a part with a similar one.

Considering the product category of non-connected devices, these products go under the category of electrical and electronic equipment (EEE). The Global E-waste Monitor 2020 (Forti et al., 2020), or GEM, mentions how EEE has become an important part of the consumer's daily life, but the increased consumption of these products has led to an increasing e-waste - cycles of consumption has produced a waste stream which is increasing. The GEM report states that the waste stream is estimated to increase from 53.6 Mt to 74.7Mt by 2030 (Forti et al., 2020).

There are many posterior factors which are sustaining the negative development. For instance, factors such as higher consumption rates, products having built-in flaws which affects the potential lifespan and few options to repair are some mentions (Forti et al., 2020).

The latter has in recent years gained more popularity and goes by Right-to-Repair legislation. This legislation aims to penalize the industry for making products less salvageable and weaken the options for repair (Chapman, 2021). As I will address in the next section, reducing the options to repair products is a form of obsolescence because this action can prolong the product lifetime (see postponing obsolescence).

Top left, Image 1: *KF 20* - Florian Seiffert(Braun, 1972) (Core77, 2013), Top right, Image 2: *HE 1/12* - Reinhold Weiss(Braun, 1961), Bottom (Core77, 2013), Image 3: *Haier* - Red Dot Design Awards (reddot design award, n.d.).

Consequences of Obsolescence

Before defining obsolescence and introducing the reader to the different types of obsolescence, this section highlights some consequences of the phenomenon. This part acts as a justification of the theme obsolescence with respect to the perspectives of both the environment and sustainability, but also introduces possible avenues for design interventions. As part of the initial question "what is planned obsolescence and what its implications?", the last part concerned with *its implications* will be taken on in the upcoming part.

At first glance, there are few things that come to the eye when looking into products or non-connected devices. In today's society, we as consumers have long been in an obsessive state of production-oriented and fast-replacement (Chapman, 2021a). Jonathan Chapman further states that "Our material possessions connect us to destructive practices via invisible threads of commerce, politics and power." (Chapman, 2021b). Indeed, this has been the norm until now, where this material throughput have consequences for both consumption and waste. Hence, the first implication of obsolescence is concerned with consumption of products.

The two others are related to waste, where we must consider products in relation to sustainability and the environment. The 1.5-degree target set by Paris-agreement is related to carbon footprint, where the goal is to minimize the carbon emissions through sustainable lifestyles (Club of Rome et al., 2021). Parallels from the carbon footprint can be drawn to products and their life cycles - the beginning, middle and end make up a product's life span.

Each phase involves different aspects such as the mining of materials, processing and manufacturing, packaging, and transport - each step leave behind a carbon footprint. The last two implications of obsolescence is therefore concerned with the origin of products (mining and resources) and the end life of products (waste). Both implications affect material efficiency, but this factor is also an important contributor to energy efficiency. In this section I investigate the following implications of obsolescence:

- Negative effect on consumers (consumption)
- Material and resource depletion
- E-waste

Once again, the motivation behind this section is to address the problems related to obsolescence and create awareness about some of its implications (e.g. as this thesis brings up: negative effects on consumption, depletion of materials and E-waste).

Through the description of the different implications, I hope to justify why I picked obsolescence as a central problem for my thesis, but also to enlighten about how the term is interconnected with other issues and problems. Obsolescence can be said to be a consequence of ineffective policy environment, reckless consumer behavior but also a systemic failure in design to consider end-of-life. The latter is derived from the fact that the facing issues with obsolescence arise both at the beginning and in the end of product life cycles.

Top, Image 1: Consumption (Adelman, 1964), Middle, Image 2: Resource Depletion (Burtynsky & Flowers Gallery London, 2015), Bottom 3: E-waste & Waste (Becker, n.d.).

Consumption

In Norway, about 2/3 of the carbon emissions originate from private consumption, where up to 70% of the people from this survey agree upon that it is the authorities that should pose requirements for product lifespan and repairability. Up to 63% think that should be marked with a net carbon footprint-indicator (Forbrukerrådet, 2021).

From the perspective of non-connected devices, it is estimated that the total global consumption of electrical and electronic equipment increases by 2.5 Mt, annual (Forti et al., 2020). This development is linked to the widespread global economic development. Looking into the two most populated countries in the world, i.e. China and India: by 2027 China's consumption is estimated to reach $8.2 trillion, a double from a decade ago; in India the annual consumer spending is expected to increase from $1.5 to $6 trillion by 2030 (World Economic Forum, n.d.-a). This development in global consumption will have a big effect in terms of carbon emissions, but also the environment.

Until now, I have been only taking about increased consumption from a consumer's side. Investigating the technological advancement and innovation, we would think this would have led to a dematerialization or an ostensibly declining material world. It is natural to think as products get smaller so do the environmental impact during the manufacture of these. In a study of dematerialization in 57 different cases it was found that "the environmental impact does not continue to diminish as affluence of increases." (Magee & Devezas, 2017).

Image 7: Woman in red jacket standing near green and white plastic crates (Dodzy & Unsplash, 2020)

Material and Resource Depletion

An increased consumption leads to a higher demand on goods and material inputs in production. High demand leads to a destructive practice starting with higher extraction rates of rare elements from the earth - materials and resources that goes into the production of more goods, where mining after sought rare elements depletes of the earth's non-renewable resources. Minerals such as tin, tungsten and titanium are common elements in production, but are also regarded as conflict minerals in unregulated areas imprinted with violence, war and appalling working conditions (Chapman, 2021b).

On the other end, consumers are encouraged to replace perfectly fine products with newer ones, at the same time as manufacturers withdraw support of older product lines (Sheibani, 2014). This way, many products are abandoned prematurely before they reach their end of life and end up on landfills. Once products reach this graveyard for discarded products, recover and recycle of rare earth metals become difficult.

Image 8: photography of excavators at mining area (Vanyi & Unsplash, 2018)

E-waste

In section 4 I mentioned that EEE products are an important driver for increasing e-waste. Globally, a 53.6Mt of e-waste was generated, where this number is estimated to increase to 74.4 Mt by 2030 (Forti et al., 2020). Higher numbers of consumption, products having short life cycles and few options to repair outdated products are central drives for this development. How is this e-waste then generated? When owners of products no longer intend to reuse them, they are thrown away. This can be because the product is for example perceived to be outdated or no longer fulfill the need of the user - the intent to reuse the product ceases to exist (United Nations University & Step Initiative 2014, 2014).

EEE products are a composition of different materials, thus once becoming e-waste, the waste stream becomes a mixture of materials that can be harmful to both environmental and the human health (Miljødirektoratet, n.d.). It can be added, that EEE products can also contain rare earth metals as mentioned earlier. Therefore, because of its material content, e-waste is also subject to theft at delivery points for e-waste, but also in some occasions exported illegally from a high-income to a low-income country (Norsirk et al., n.d.). This volume of transboundary waste stream of used EEE articles is assumed to be 7-20% of the generated e-waste (Forti et al., 2020). Often the destination of the e-waste are landfills in low-income countries, where people work in informal recycling sectors are exposed to harmful substances in e-waste (World Health Organization, 2023).

Image 9: Man walking next to a pile of e-waste (Pcmag, n.d.)

Obsolescence - A Definition

It is hard to find a unique definition for obsolescence because the term is used interchangeably with planned obsolescence. It is even sometimes described as a strategy for companies to generate profit (Jensen et al., 2021). Before defining obsolescence, it is important to highlight that this thesis is concerned with obsolescence in products and its affiliated aspects. I want to give the reader an overview of what other types of obsolescence exists in products. Before giving a general definition of the term, let's take a look at some of the intricacies behind the term "obsolescence" in literature.

For instance, obsolescence is defined to be products that are "designed to have uneconomically short lives, with the intention of forcing consumers to repurchase too frequently"(Fishman et al., 1993).

Another definition includes the aspect of disposal and environment: "(...) promotes shorter durables replacement and disposal cycles with troublesome environmental consequences" (Guiltinan, 2008).

Lastly, I want to include a psychological aspect, which will later be described as style obsolescence: "Planned obsolescence is defined as an instilling in the buyer the desire to own something a little newer, a little better, a little sooner than it is necessary." (Adamson & Gordon, 2003).

There are many more and (Kuppelwieser et al., 2019) provides a nice overview for more definitions of planned obsolescence.

Next, I give a definition of the term obsolescence and thereafter break it down into four types of obsolescence.

Obsolescence

Obsolescence involves both un- and observable qualities within products which renders them out of date or out of use in the eyes of a consumer. These qualities can sometimes be resisted or postponed through certain actions(more on this in next section). Ignoring these qualities can lead to an early replacement or discard of the product.

Above I gave general definition of the term obsolescence, which can again be divided into four types of obsolescence:

- Planned obsolescence
- Indirect obsolescence
- Incompatibility obsolescence
- Style obsolescence

Not all of these will be addressed in this thesis, but since this thesis' first part is about creating awareness about the topic it is therefore included here. Below is a more in-depth description of the different types of obsolescence.

Planned Obsolescence

Often regarded as failure in the hardware of products. This involves two mechanisms, either products have shorter life span or they function for a limited number of operations (Valant, 2016). Inkjet printer cartridges is a typical example.

Incompatibility Obsolescence

It is related to the functional and technological aspects of a product. Normally, products with an OS stop working optimally after successive software updates. This again will nudge consumers to replace the product because the user experience deteriorates.

Indirect Obsolescence

Can be divided into both logistical and hardware aspects. Logistical aspect involves the diminish of manufacturing sources and material shortages (Sierra-Fontalvo et al., 2023).

The problem arises when repairing a product and a required component is unobtainable, or the repair itself is more expensive than the replacement of the product. Indirect obsolescence in hardware involves ease of access to the product's components - assemble of the product dictates the difficulty and cost of a repair.

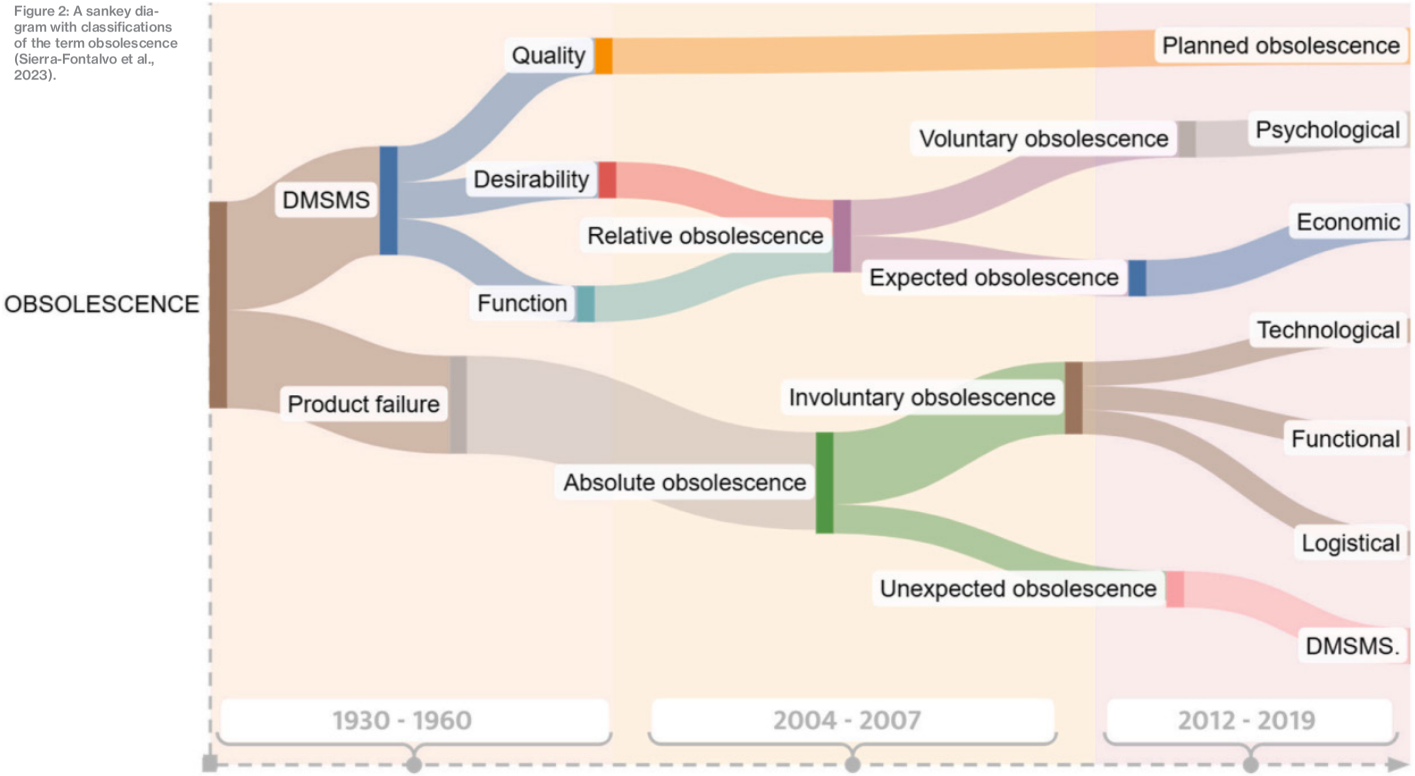
Style Obsolescence

Refers to the psychological aspect in products, such as aesthetic and underlying market strategies. For example, aesthetics involves how fashion, style and social trends are driving premature disposal of products without them exceeding its potential lifespan. As for marketing strategies market campaigns can lead to product replacement even though the product functions perfectly.

A Sankey Diagram with Classifications of the Term Obsolescence

The article "A deep dive into addressing obsolescence in product design: A review" provides a very informative overview of the evolution of the term obsolescence (Sierra-Fontalvo et al., 2023). Note that the article provides several terms and types of obsolescence (see figure), but by combining the article with a briefing made by the European Parliamentary Research Service (Valant, 2016) I was able to come up with 4 distinct types of obsolescence even though there are some overlaps.

Figure 2: A sankey diagram with classifications of the term obsolescence (Sierra-Fontalvo et al., 2023).



Replacement Motives in Consumers

Until now we have been investigating the term obsolescence from a product perspective. A natural next step is to investigate replacement motives in consumers. In the literature, several factors influencing consumers are mentioned. In the article "Influencing Product Lifetime Through Product Design", van Nes and Cramer derive three major lists concerned with consumers that can assist us in synthesizing design strategies for slower products enabling future repairs and upgrades. The main takeaways in this section are factors in the article. Factors, that influence consumer's evaluation and decisions of products. These are dubbed replacement motives.

The article highlighted three main lists concerned with factors which influence consumers. The recurring factors as to which replacement needs consumers have, can be summarized to be:

- Style (style obsolescence)
- Technological advantages and technical conditions of products (e.g. incompatibility obsolescence)
- Marketing influence such as price and sales promotions
- Change in circumstance and aspiration
- Product consumption

(van Nes & Cramer, 2005).

The two first points have already been briefly treated in section 6. As for the point about marketing influence through price and sales promotions, Barry L. Bayus have an interesting conclusion in the matter. Through his investigation into the effect of marketing efforts, it showed that price has the most impact in accelerating replacement purchases. Furthermore, factors, such as price and promotions were shown to be of significance when related to the replacement period of products (Bayus, 1988).

Third point could be for example be extrinsic factors. Mentions such as change in financial or family circumstances lead to acquirement or discard of products. An example could be a family where the number of family members has increased from three to five, and as a result the parents bought a second car to so both parents can drive the kids to school in order to free up time.

Not much is described in the last point about product consumption in the article. In a video published by O'Reilly, Rob Coneybeer, a veteran of the Silicon Valley venture capital industry, talks about obsolescence strategies for connected hardware, where I interpret the last point to be about how consumers buy into an ecosystem of products (O'Reilly, 2015).

An example could be the Apple ecosystem with its line of different products provides the users with great software. What started out as a single purchase of an iPhone, has with time led to the consumer buying adjacent Apple products to enhance their user experience - the consumer is encouraged to repeat purchases of different product lines, which could be the interpretation of product consumption.

From the factors in the main lists, the article categorized factors by their importance through filtering on frequency of mentions in literature and the size of the role (van Nes & Cramer, 2005). This approach led to synthesis of four general replacement motives. The motives are sorted in the list below, with no. 1 takes highest precedence in terms of most important motive of product replacement:

1. Wear and tear - product replacement occurs because possessed product is defective or no longer is operable

2. Improved utility - replacement occurs because of a combination of factors. E.g. defective product combined with the desire for improvement of safety or economy of use.

3. Improved expression - a combination of factors, e.g. defective product, and desire for improvement of design/quality/comfort of use.

4. New desires - Product replacement occurs because of new desires. Possessed product is not defective: Examples of new desires: comfort of use, design, quality, social value, safety. etc.

Point 1 is described to be as a typical **'push'** mechanism, because the product pushes the owner towards replacement. On the other side, point 4 is described to be a typical **'pull'** mechanism, since new products can have tendency to pull in consumers, tempting them with new desires and possibilities. Point 2 and 4 is a combination of both mechanisms.

Opposite of Obsolescence

So far, we have explored various aspects of obsolescence, delving into both internal and external mechanisms affecting products, but also how these might appear to consumers.

Now, let us shift the focus to aspects contrasting obsolescence - what actions opposes obsolescence and how can design contribute to the creation of long lasting or slow products? This section aims to provide insights into how we can tackle obsolescence.

Types of Maintenance Acts

As mentioned, we have obsolescence with short lasting products, products that are discarded because they are no longer functioning, dysfunctional or are no longer desired by the owner which results in premature disposal, increased consumption etc.

On the other side, we have product longevity and products that last. These products are kept by its owner, but not without effort. Owners conduct a range of maintenance acts, ranging from light to intensive. In his book, Meaningful Stuff, Chapman mentions two types of maintenance: preventative and corrective (Chapman, 2021a).

The first type of maintenance preventative is described to take place before failure occurs in a product. It is about the everyday upkeep of a product, for example sanding and oiling a wooden table, or washing and ironing your clothes.

Secondly, corrective maintenance takes place after a product fails. Here, the goal is to return a dysfunctional or broken product to its former working state. Corrective maintenance is used interchangeably with the term repair.

A last type of maintenance act is a progressive repair process, rather than a regressive act off restoration, as it is the case for the two first maintenance acts. It is described as a "transformative repair" (Chapman, 2021a), where repairing an object leads to change in one or several aspects: appearance, function, perception, or signification (Keulemans et al., 2017).

The Japanese art of golden joinery technique in pottery, kintsugi or sashiko - decorative reinforcement stitching in garments are helpful examples of this particular type of repair. A characteristic of transformative repair is that the owner personalizes the product - adding a self-expressing value to the product.

Kintsugi

Image 10: From kintsugi to tsuiki: Lessons from japanese craft masters (BBC Travel, n.d.).

Sashiko

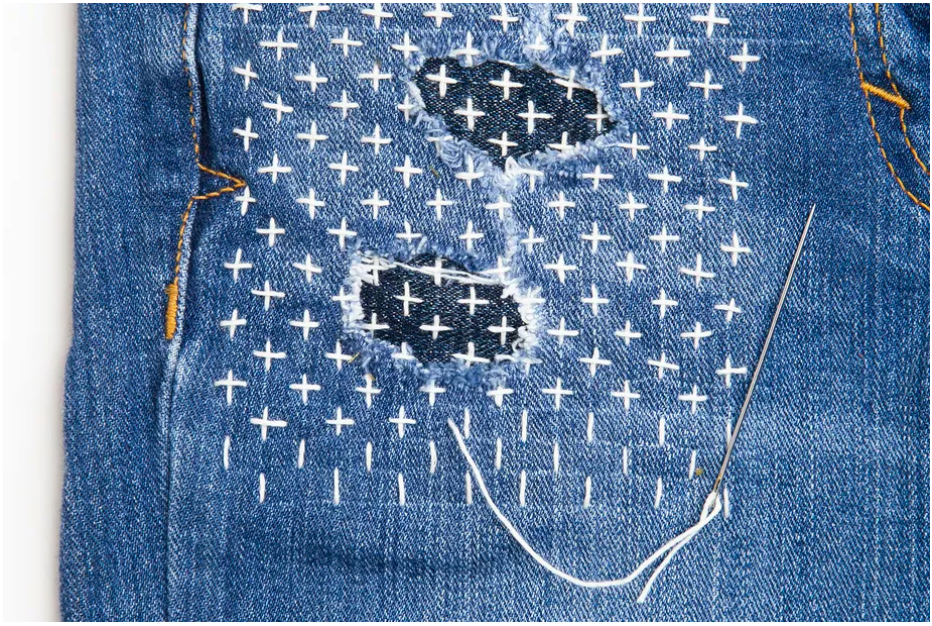


Image 11: Instead of hiding rips and tears, the visible mending movement turns them into art (Marquez, 2019)

Maintenance Supports Product Longevity

As a result of an owner investing time and effort in restoring or altering a product, the overall effect is that the product is kept longer. This effect can be further divided in two. Note, in literature these two effects are used interchangeably:

Direct effect (Mugge et al., 2009)

==

Objective effect (Gregson et al., 2009)

Indirect effect (Mugge et al., 2009)

==

Subjective effect (Greson et al., 2009)

To keep things tidy, I will be addressing these effects as objectively and subjectively, in the discussion about maintenance and repair. What the three maintenance acts have in common, is that they result in two effects, one affecting the possessed object, objectively, and the second the bond between owner and the object, i.e. subjectively:

Objectively, the product is operatable for a longer duration, i.e. the lifetime of the product is extended. This aspect is concerned with the hardware and physical properties of the product.

Subjectively, revives the affection for the product and strengthens the emotional bond with the product (Mugge et al., 2009). The product demonstrates and serves as a remainder of the owner's competency and capabilities, both for others and for oneself (Chapman, 2021a). The Subjective effect is also prone to the IKEA effect (Norton et al., 2012), which involves people's increased appraisal for self-assembled products, but also repair and maintenance of products since all these acts demand effort from the owner.

Why Maintenance?

It is difficult to restrict only to the act of maintenance. There are other acts that facilitate users to bond with their products, such as upgrade, adapt, repair, reuse, repurpose, refurbish, remanufacture and modularity, where these can be mechanisms of product longevity and help develop emotionally engaging product experience through being:

- A vessel for self-expression and personalization
- A facilitator active material participation, which can again develop into habits or rituals
- A familiarization - users are allowed to see inside a product
- An alternation, changing how owners perceive an act, e.g. maintenance from being perceived as a chore to become an act of love, appreciation, or care.

(Haines-Gadd et al., 2018)

Other Approaches to Address Obsolescence

Maintenance acts are clear and defined actions to how product lifetimes can be prolonged. Another way to look at approaches for tackling obsolescence can be from a more general view. For this we will be looking into resisting and postponing obsolescence, one of the contains maintenance acts as an mechanism for product longevity.

Design for Long-life Products: Resisting Obsolescence

Long-life products are often characterized by design strategies which focus on two aspects of durability: the first being emotional durability through attachment and trust; the second overall durability through reliability and physical durability (Lesly Sierra-Fontalvo et al., 2023).

Durability is here referred to physical attributes of a product such that it can take wear and tear without breaking down (Bocken et al., 2016).

- As for attachment and trust, these products that are exposed to these strategies are more likely to be liked, loved or trusted longer by their owners. As a result, owners keep their objects longer - the products have an increased lifespan because they are not discarded. Products that have been designed to take into account both attachment and trust are characterized by a higher degree of user connection, which can help them keep their objects for an extended time (Lesly Sierra-Fontalvo et al., 2023).
- Reliability is related to that " a high likelihood that a product will operate throughout a specified period without experiencing a chargeable failure" (Bocken et al., 2016).

Resisting obsolescence is about designing and creating products having a long lifetime. Special attention to the selection of durable materials can push products towards sustainable use and maintenance patterns within users. A material that is durable allows consumers to predict how a product might behave during the time of possession.

Design for Product Life Extension: Postponing Obsolescence

The main idea behind the second approach to tackle obsolescence is to extend a product's lifetime through allowing owners to perform a set of actions on it, thus performing some kind of alteration on the relationship between owner and their possession (Lesly Sierra-Fontalvo et al., 2023).

Altering the relationship between owner and product can be done through transferring, e.g. inheritance or change of owner, change of the product itself or how users interact with the product (Remy & Huang, 2014).

It is the owner's decision that defines when a product is to be discarded or kept.

Put differently, the owner sets the boundaries for a product's lifetime.

Earlier in this chapter I discussed how maintenance acts to oppose obsolescence. It can be said that maintenance acts help postpone the obsolescence in a product, but the postponing of obsolescence is not only restricted to this.

Products which allow actions to be performed on them, such as maintenance and repair, upgradability and adaptability, standardization, modularization, compatibility and dissolvability are also important factors in postponing obsolescence.

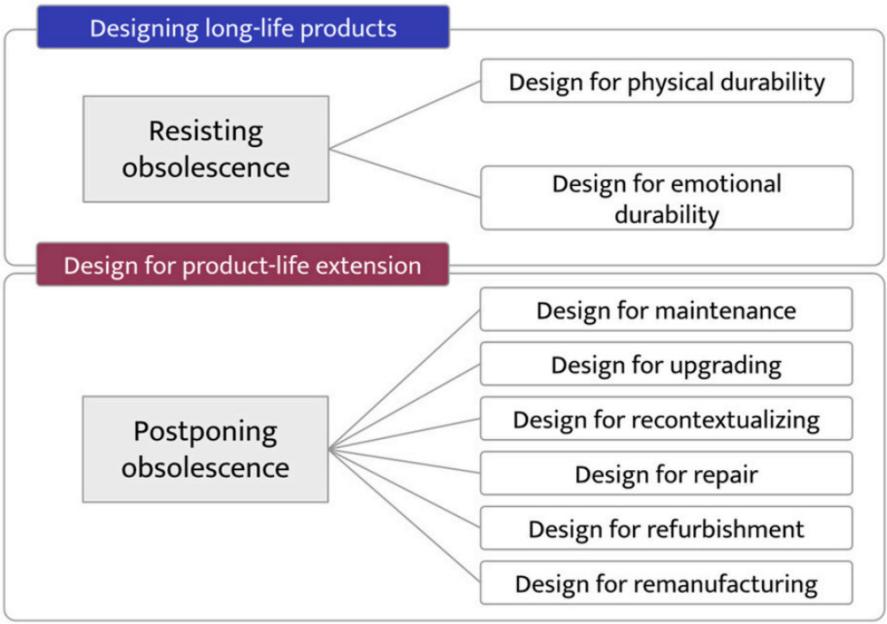


Figure 3: Typologies of design approaches for product integrity (Sierra-Fontalvo et al., 2023).

Political Work Related to Obsolescence and Repair

Before inquiring into barriers touching obsolescence and maintenance acts on an individual level, I will give a brief overview of existing political steps that have been carried out to counteract obsolescence, but simultaneously, have enabled factors which promote longevity in products.

These are important because the bills greatly improve the promotion and facilitation of longevity in different product categories.

Initiatives such as Right to Repair (European Commission, 2023), Nordic Ecolabel (Nordic Swan Ecolabel, n.d.) and Extended Warranty (Federal Trade Commission Consumer Advice, 2021) are successful examples on promotion and governing of product longevity in specific product categories (Marcus & Policy Department for Economic, Scientific and Quality of Life Policies, 2020).

These bills and initiatives have put demands on manufacturers and companies to supply extra parts and information, but also counteracted company policies related to:

- Repair manuals
- Repair shops, more transparency promoting healthy competition between and alternatives to repair shop, instead of companies monopolizing on repairs
- Removal of fine print clauses in user agreements (typically costumers agree not to repair their products)
- Other mechanisms that prevent products from being repaired, e.g. copyrighted software and digital locks
- Extending product warranties

(Magazine & Matchar, 2016) & (Jensen et al., 2021a)

Further, regulations regarding product and service liability (framework in EU26) has defined what constitutes a defect in products and who is liable for, i.e. liability befalls the producer of a product.

Additionally, France stands as an example of a state addressing the problems of product obsolescence by passing a bill banning product obsolescence (LOI N° 2015-992 Du 17 Août 2015 Relative à La Transition Énergétique Pour La Croissance Verte (1), 2015).

Defining a defect is an approach to tackle obsolescence. Another approach that has been used in politics, concerned with promoting product longevity, is utilizing frameworks to enforce product longevity onto manufacturers and companies.

This "hard" mechanism accommodates the need for products having a minimum lifetime, inform customers and users about expected lifetime of a product facilitating informed purchase and finally, promoting modularity in products which helps owners to easier replace broken or defunct components (Marcus & Policy Department for Economic, Scientific and Quality of Life Policies, 2020).

Image 12: Top 10 Learning & Development Conferences of 2023 (Cale, n.d.)

Key Findings

Chapter Overview

“On the surface, barriers relevant for product longevity can be divided into business, product development and *users*”

Barriers to Product Longevity

On the surface, barriers concerned with product longevity can roughly be divided into business, product development and users (Jensen et al., 2021). Given my situation, it is difficult to look for design interventions in the area of business, due to the fact that this thesis is written without the involvement of any business.

Consequently, I will focus more on describing barriers touching product development and users with focus on the latter in this section. The findings presented in both section 11.1 and 11.2 can eventually challenge the work of designers, who must consider a compromise between an array of factors which influence the longevity of a product.

The points I will list can hopefully educate designers, make them aware of the barriers related to product longevity and repair of products, thus help create avenues of further research. First article for this section, "Barriers to Longevity" by Jensen et al.

This article is inspiration for defining the barrier categories: business, product development and users, where the business- category is omitted. The barriers of first category pertaining product development:

- Difficulty keeping up with rapidly changing trends and fashions
- Technological advancements render long lasting products obsolete more quickly
- Evolving societal norms contribute to the obsolescence of long-lasting products
- During innovation of products, there is insufficient emphasis on durability and longevity.

As for the usage and user barriers:

- Consumer behavior is influenced by marketing mechanisms such as retailers' promotion and sales of product categories having short life cycles
- Decreased emotional attachment to products
- Material quality is an aspect customers rarely pay attention to during purchase
- Hard to consider durability and longevity during purchase decision
- Uncertainty regarding modularity in complex products - customers can be misled by information or it is poorly indicated in product package.

(Jensen et al., 2021)

There are several dynamics behind the usage and user barriers, but two things stand out: insufficient information to make informed purchases; consumers being subjected to marketing influence, through mislead or information overflow - both involve information that is available to customers but they are operating on different information channels.

As for the barriers related to product development, the mechanisms here are difficult for designers to approach, but a take could be how designers should take a more active role in the design-making within a business, pivoting towards innovation and research on products which are durable and long lasting.

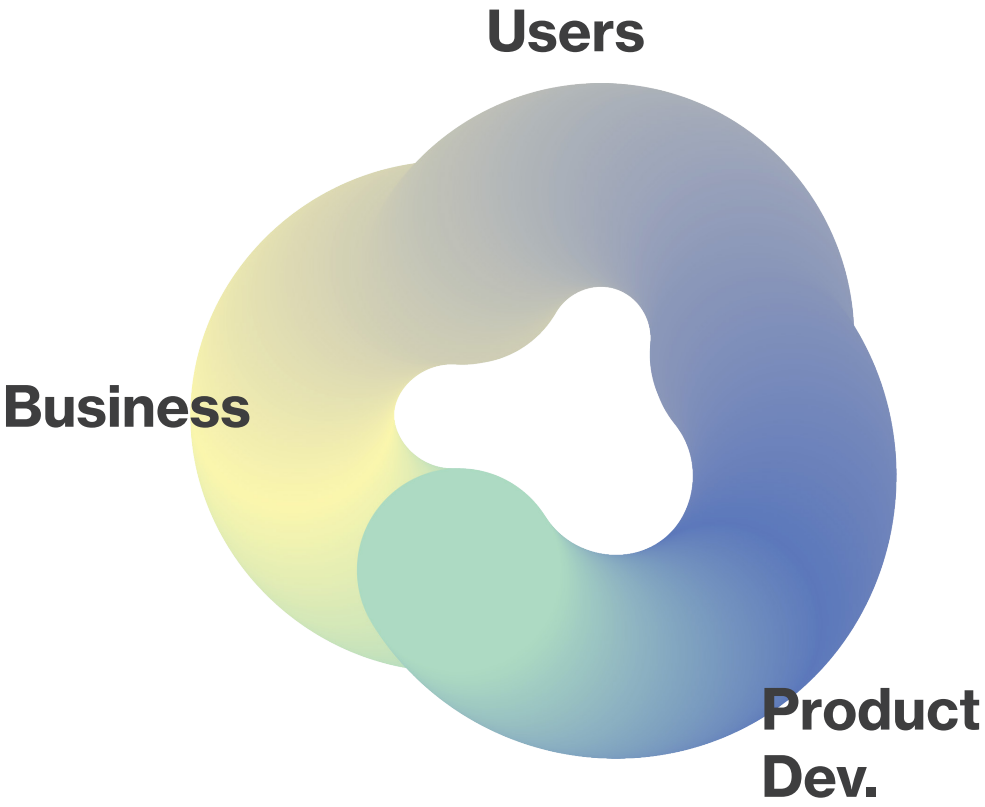
Using the findings about the three barrier-categories in the previous article, I further investigated a study conducted by the EU about promoting product longevity. It provides information about barriers to product longevity in product development and consumers.

The first concerns with product development, how product longevity can impede or even prevent improvements of a product category, e.g. prolonging the lifetime of a product category during improvements for its energy efficiency (Marcus & Policy Department for Economic, Scientific and Quality of Life Policies, 2020).

A trade-off between product longevity and improvements needs to be considered, where the prolonging of lifetime in a product category does not necessarily imply an improvement.

Secondly, the other category is related to findings about consumers - there is a division in terms of user preference: one part is open to having long lasting products for some categories; the other part worried about high cost and difficulty of acquiring maintenance (Marcus & Policy Department for Economic, Scientific and Quality of Life Policies, 2020).

Note, the last point can prove to be a hindrance when designing products for longevity.



Barriers to Maintenance Act or Repair

In prior section, I described factors that can impede longer lifespan in products. In the following section I will introduce the reader to barriers and difficulties which can be found within repair and maintenance acts.

The presented findings are collected from two articles: the first describes barriers affecting users during a repair of their personal possessions, it divides these difficulties and barriers into three aspects and finally, introduces a model; second is a report about participants from a repair café, providing valuable insight into private people's stance towards domestic repair.

Last report is used to complement and back up the information provided by first article.

In Nazlı's article about barriers to repair, the idea that users are key to postpone product replacement is central, since the decision to repair a possession lies within the users. Furthermore, the decision is then influenced by several factors, which Nazlı identifies.

Each factor can then be perceived as an opportunity for designers to understand and change the behavior of users towards repair.

Even though each factor here is represented individually in a list, the reader needs to bear in mind that the factors should not be evaluated and investigated independently as each and one of them are interconnected in a complex system (Nazlı, 2020).

The factors can be divided into three aspects, characterised by being a motivation for users to execute a repair(M), barrier(marked B) or a combination of both (MB):

Technological:

- -Required knowledge **(B)**
- -Required skills **(B)**
- -Required time and effort **(MB)**
- -Accessibility of materials and methods **(B)**
- -Design related problems (planned obsolescence) **(B)**
- -Endurance **(MB)**
- -Reversibility **(B)**

Emotional:

- -Perceived pleasure **(M)**
- -Perceived negative feelings **(M)**
- -Environmental concerns **(M)**
- -Negative stigma attached to repair (socio-economic perception - associations to economic hard ship and poverty) **(B)**
- -Perceived interest (trends and technologies, interesting repair act) **(M)**
- -Emotional attachments **(M)**
- -Lack of confidence **(B)**

Value:

- -Financial factors **(MB)**
- -Aesthetic value **(MB)**
- -Functional value **(M)**
- -Symbolic value **(M)**
- -Condition of the product **(MB)**

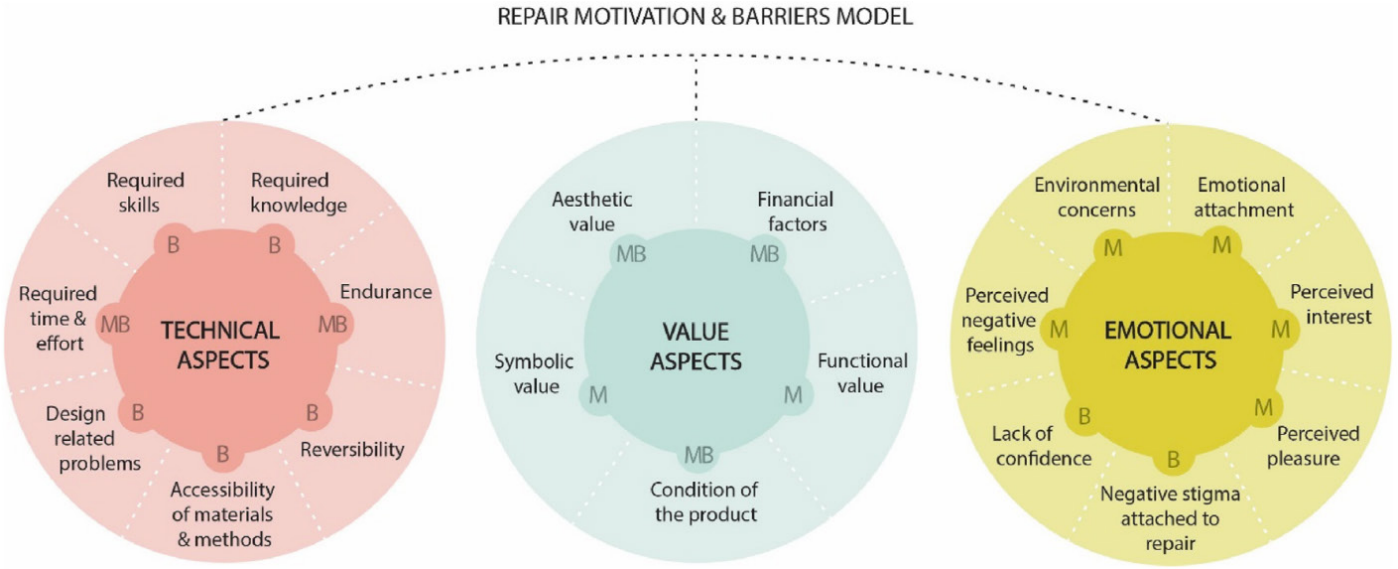


Figure 4: Repair motivation and barriers model diagram illustrating the factors affecting people's repair behaviour (Nazlı, 2020)

Technical aspects refer to the requirements that need to be fulfilled for users to execute a maintenance act: these can be external requirements such as available equipment, materials, and knowledge about how to. On the contrary, internal requirements revolves around the objective that is going to repaired - the characteristics of damage and its design and quality.

Emotional aspects involve the emotional response within users towards the activity in terms of specific maintenance act. Another key agent is the product which also influence the emotional aspect functioning as a barrier or motivation for the user to do the repair.

Lastly, the value aspect. These factors seem more randomized since they can refer to a wide array of values, e.g. aesthetic, symbolic, and functional value. What is shared among these is representing relative worth or utility of the object and maintenance act (Nazlı, 2020).

Every factor belonging to each of the three specified aspect are described thoroughly in the article.

These above factors and aspects can be controlled by something the author introduces as Fogg's psychological behavioral model, which the author extends and invents the "Repair motivation and barriers model" (Nazlı, 2020).

In Fogg's model, three factors are central, forming behavior in people. Of these motivation, ability and triggers are mentioned and needs to be present for a person to be able to execute a repair (Fogg, 2009).

A person should be motivated, have the ability/capacity to perform a maintenance act, in addition to be equipped with right type of trigger - a reminder, signifying users to execute the targeted action at a certain time.

Not only allows Fogg's model to identify motivations, abilities and trigger, it can also serve as means to control or influence/change behavior within users. This is useful for designers when designing products and mechanisms as we will see in section 16. Opportunities - Working Against Obsolescence.

While not all factors are mentioned in the report based on the London-based Restart Project and their activity involving pop-up repair events targeting amateurs in the need of guidance to repair, similar factors come up. It introduces how with time, products develop faults.

Faults which are difficult for amateurs to repair can be characterized as design related problems related to the technical domain. This can have negative effects on the confidence belonging to consumers. Even though, resources are available to consumers, there are still indications about the lack of skills, knowledge, or confidence to attempt a repair, which many of the factors also belong to the domain of both emotional and technical value (Cole & Gnanapragasam, 2017).

As a result, an interesting mechanism is discovered: the report issues the lack of trust within consumers to commercial repairers. As high as 45% of consumers in the survey say they cannot name a trusted commercial repairer and public information about existing repair ventures is lacking (Cole & Gnanapragasam, 2017).

Furthermore, the report casts light over consumer behavior and states that as much as 48% do not feel confident "at all" to execute a repair. Behind the lack of confidence there might lie a reason for fear, where an attempt to correct a fault in a possession accidentally end up being a result of failure, where the initial fault ends up far worse.

This "sabotage of an object" can represent a proof of a users' both incompetency and poor judgement - it becomes an object of shame (Chapman, 2021a). The effect of a such

misstep, is therefore the premature disposal of a product.

Sensemaking and Process

Up until now, a significant portion of the thesis has been revolving around discoveries from literature studies and conveying the different topics.

The goal has been to create an informative and theoretical delivery, where I present literature and models that are relevant for opposing obsolescence.

Secondly, in this thesis' final section, I will identify a focus area for my further work. As I earlier highlighted obsolescence is a big problem, at the same time it is difficult to counteract because of its complexity. Prior student work, have tried to address this issue through work concerned with product development: student works have involved developing frameworks, models and products relying on both durable materials and emotional durability. My approach to obsolescence investigates and tries to address consumer behavior and looks for appropriate design interventions.

Insight

Explore problems: What problems are there related to the topic? How can obsolescence occur?

Idea

Further explore problems and develop ways to how. Generate knowledge as I read and take notes: Looking for interventions.

Development

After establishing a design intervention, start to idea generate and familiarize with similar or potential solutions.

Mapping: Feasibility Study

Getting an Overview

I did two mapping sessions. The first was creating a mind map about planned obsolescence and what comes to my mind about the topic. This was done before the initial literature study and selection of product categories.

Here I explored product categories in the context of electronics and furniture, psychology with focus on consumer behavior, and lastly business involving strategy and services.

This first mind map was used as a utility in the discussion with my supervisor and helped internalize the understanding of what obsolescence could be. It was not used for hypothesizing pain points nor locating points that are valuable for design intervention. The second mind map was used for this. The first mind map is depicted in this section while the second can be found in the appendix.

Second mind map was used for locating design interventions I found interesting but also any potential pain points. See appendix B.

Paint Points

From the second mind map, I tried to establish an overview of obsolescence and its direct and indirect consequences, and its occurrences, i.e. how and where obsolescence turns out in daily life. The topic felt to begin with, bounded, and then turned out to be everywhere - I had to eventually restrict my mapping activity.

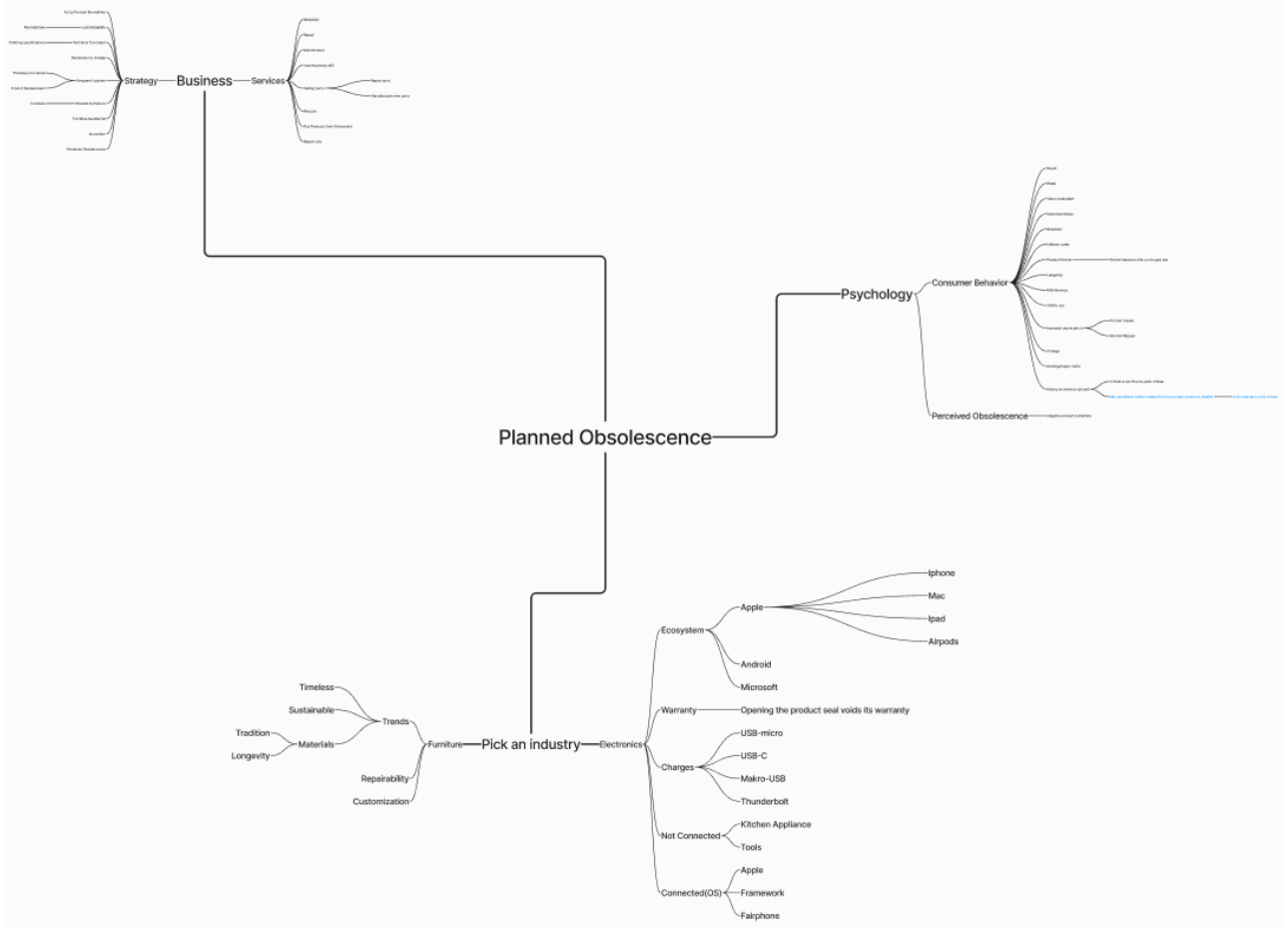
Not only that, a more important point was the helplessness I felt when trying to identify potential interventions. Initially, I felt that the actors behind obsolescence were manufacturers and producers - agents deliberately planning and limiting the product life times in the product development process. In the article, "Planned obsolescence: who are those planners?" (Longmuss & Poppe, 2017), manufacturers and producers were the interviewees.

Here, they rejected the accusations about planned obsolescence, which is understandingly, and focused the attention to basis conditions and restrictions of developing and producing to be the factors behind why products are quicker replaced, i.e. having a shorter lifetime (Longmuss & Poppe, 2017).

Truly, there was nothing I, as a lonely designer, could do about obsolescence related to manufacturing, companies, developers and commerce. As stated by Longmuss and Poppe, "in this sense obsolescence is systemic" (Longmuss & Poppe, 2017).

Another approach involving designing products of material quality and durability, which allows its owners to emotional bond with it, has earlier been addressed in other student projects. Therefore, I felt this was not the direction I wanted to pursue. I looked for other pain points in the second mind map I created.

Eventually, I landed on picking consumers and their activity of shopping - the act of acquiring a new product - as a potential intervention.. A natural step was therefore looking into pain points related to their shopping experience.


Planned Obsolescence
Business
Strategy
Services
Psychology
Consumer Behavior
Perceived Obsolescence
Pick an industry
Furniture
Trends
Timeless
Sustainable
Materials
Tradition
Longevity
Repairability
Customization
Electronics
Ecosystem
Apple
Iphone
Mac
Ipad
Airpods
Android
Microsoft
Warranty
Opening the product seal voids its warranty
Charges
USB-micro
USB-C
Makro-USB
Thunderbolt
Not Connected
Kitchen Appliance
Tools
Connected(OS)
Apple
Framework
Fairphone

Investigate Potential Design Intervention

Criterias

From the literature I presented findings related to consequences of obsolescence, replacement motives in consumers etc.

Some of these act as criterias for when I discover potential design interventions.

The criterias should first and foremost adhere to the product category, which are characterized by being electrical and non-connected appliances where mechanical or performance factors dominate whether or not an owner disposes of the device. The reason for this comes from that different product categories face different challenges concerned with obsolescence.

Lastly, I chose to pivot towards customers/users rather than product development. More precisely, consumer behavior was selected as it is influenced by marketing mechanisms and sales, and a solution here affects information provided to consumers during purchasing.

By addressing prior pain points from the literature, this can help mitigate some of the barriers to maintenance act or repair, technological, emotional and value, through informed purchase.

That is, customers are informed about product qualities during the process of a purchase, or before acquiring a product.

From literature I disclosed several important barriers to product longevity. Some act as criterias in selecting a design intervention, including the criterias for product category related to electrical, non-connected appliances, and customers/users as a field of interest.

The barriers to product longevity which I will consider are:

* Hard to consider durability and longevity during purchase decision

* Uncertainty regarding modularity in comlex products - customers can be misled by information or it is poorly indicated on the product package.

Last point can be expanded to include information not only about modularity but also repairability, since modularity comes hand in hand with repairability - they both permit acts where owners establish or grow emotional attachment to their possessions.

Design Statement

“Inform customers during purchasing about product qualities such as warranty, repairability or modularity through graphic labeling, reflecting the degree of difficulty to perform a repair.”

Goal

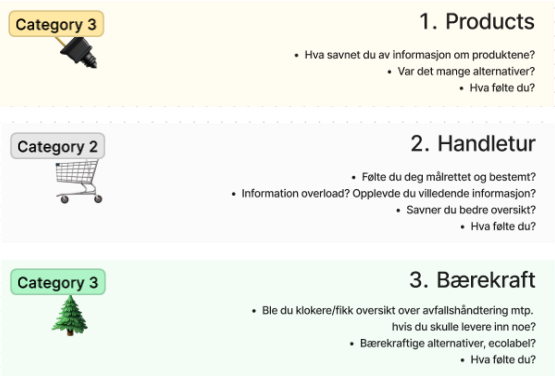
The goal is to create engagement and notion in customers about what expectations they can have towards a product before acquiring it. Meanwhile, there exists little information in service records about different product categories and articles, but information about warranty and repair effort can help potential owners (customers) evaluate/assume potential lifetime of a product and consider this as a factor when comparing product articles. With the label I wish to incentivise customers to choose product articles in favor of longevity.

Workshop

Once I defined criterias and a design intervention through a design statement, a natural next step was to investigate user shopping activity. Afterwards, I facilitated a workshop to summarize the collected data.

3 Search Fields and Workshop

For this I prepared three search fields which were necessary for the workshop to generate information about. They can be found below



1st category is about products and seeks to understand information found on products, i.e. the product emballague. The first category focuses on products, and the connection between different product articles of the same category, e.g. pricing, certificates etc.

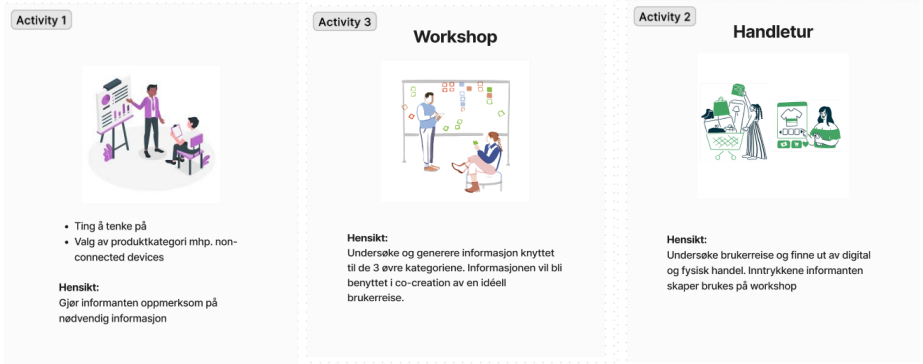
The 2nd category takes a step back and focuses on the shopping activity. Information found in the area around the product, i.e. the shelf and immediate surroundings, warranties and other sale promotions. Underlying mechanisms which can mislead customers away from durable products to seek cheaper alternatives are targeted.

Last category investigates available information about sustainability related to products, such as ecolabels, energy efficiency, sustainable materials and recycling. I was a little unsure about this category, but findings or the lack of findings can tell something about a retailer's

priorities in terms of sustainability strategies.

Activity

The facilitation involved buying a bathroom scale - a fitting article for my product category. The shopping activity was performed twice: digitally through webshop(Clas Ohlson) and a physical store(also Clas Ohlson). The informant was instructed to think out loud and made remarks about the different bathroom scales Below the workshop is divided into 3 activities.



Results

Digital Shopping

Digital shopping was the first activity that was facilitated. For browsing bathroom scales, the participant picked Clas Ohlson's website.

The reason was that the physical store is more accessible, and we planned to drop by the store after the "digital shopping". In addition to the store's practical locality, it is also a cheaper alternative.

The activity of browsing Clas Ohlson's webshop acted as a preliminary before the physical shopping and helped the participant plan the purchase activity. Some key findings from the digital shopping showed that the provided information on the website was presented in a clear and logically grouped manner, i.e. information about warranty, specification and reviews were separated but easy to find - the website was maneuverable, despite a huge selection of bathroom scales.

On the contrary, when facing two identical scales (functionality wise), it was difficult for the participant to compare a cheap model up against an expensive model - there was not enough information to distinguish these apart from price, brand, design and warranty (cheap had 2 years and expensive 5). This made the participant skeptical of the expensive alternative as the 2 scales had the same functions - any beneficial attributes should have been highlighted better. More on this in the section about physical shopping.

Physical Shopping

It can be said that the physical shopping activity was biased by the digital shopping activity since the participant already made up their mind about which bathroom scale to be acquired.

The information presented in the physical store was different from the digital. Firstly, the experience of the physical shopping activity was different. Maneuvering and locating the bathroom scales was a difficult task as sections for different product categories were not standardized and had no obvious arrangement. Finding the right product category required more effort.

Secondly, the participant expressed it was nice to see and weigh the different scales, but a huge drawback was the heavy use of symbols and certificates on product emballague.

In the prior section, I mentioned how it was difficult for the customer to compare two different bathroom scales - the only differences were price, brand, warranty and design. In addition to these differences, when investigating the emballague, the participant was confused and unsure about what the different symbols and certificates meant and if these were the reason for the stiff price - are more certificates proportional to higher prices?

Comparison

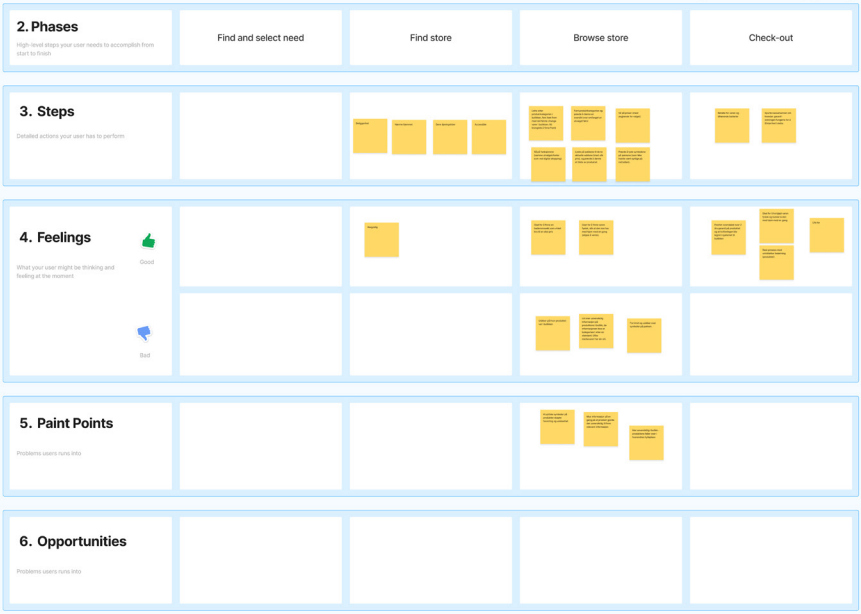
The findings from the workshop can be summarized into the following points:

- Different available information when in store compared to the digital shopping experience. Information on the package feels less detached, but the heavy use of symbols reflecting certificates were confusing and made the customer unsure.

- Information on websites were better grouped and created a better overview for the product category of bathroom scales. Information across the different product articles were diverse, where branding and warranty were the most prominent factors.

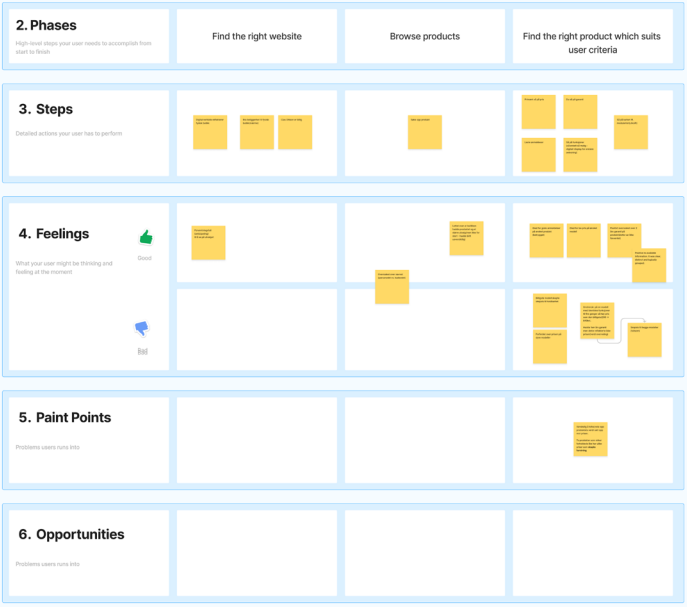
1. Visualize your user's journey through a process or activity you hope to make better for them:

Physical Shopping



1. Visualize your user's journey through a process or activity you hope to make better for them:

Digital Shopping



Ideas and Inspiration

“Inform customers during purchasing about product qualities such as warranty, repairability or modularity through graphic labeling, reflecting the degree of difficulty to perform a repair.”

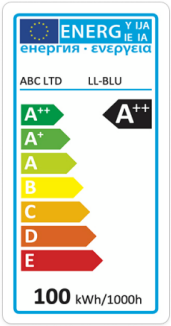
Inspiration

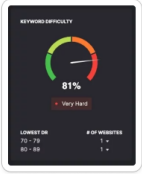
With the above design statement as an initial point for my idea, I started looking for inspiration for how customers can be informed about products which allows longevity and easier access for repair and modularity.

I knew about labels developed by the EU to describe energy efficiency in products. Even though the labels provide clear and readable information, it seems rather standardized and lacks an engaging presentation. In addition, the labels do not provide any information about warranty, potential lifespan of product and degree of repairability.

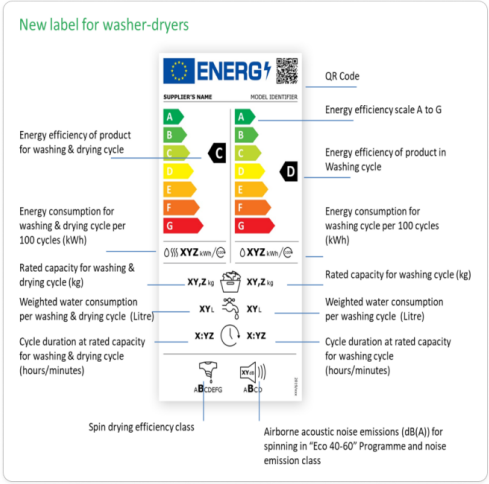
In this section I provide a moodboard with images working as inspiration.


Claude Lévi-Strauss
Structural Anthropology
Volume II
Claude Lévi-Strauss
Structural Anthropology
Volume II

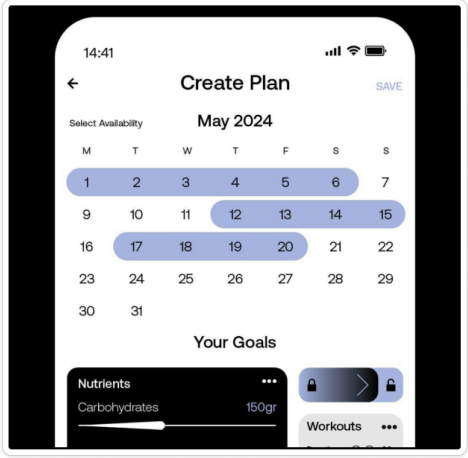

ENERG
ABC LTD
LL-BLU
A++
A+
A
B
C
D
E
100 kWh/1000h


KEYWORD DIFFICULTY
81%
Very Hard
LOWEST DR
70 - 79
80 - 89
OF WEBSITES
1
1


Wed 29 January at 7.30
Royal Festival Hall
BBC Symphony Orchestra
Colin Davis
Mozart: La Clemenza di Tito
Heather Harper
Margaret Price
Patricia Kern
Janet Coster
Ronald Dowd
John Shirley-Quirk
BBC Chorus


New label for washer-dryers
ENERG
SUPPLIER'S NAME
MODEL IDENTIFIER
QR Code
Energy efficiency scale A to G
Energy efficiency of product for washing & drying cycle
Energy efficiency of product in Washing cycle
Energy consumption for washing & drying cycle per 100 cycles (kWh)
Energy consumption for washing cycle per 100 cycles (kWh)
Rated capacity for washing & drying cycle (kg)
Rated capacity for washing cycle (kg)
Weighted water consumption per washing & drying cycle (Litre)
Weighted water consumption per washing cycle (Litre)
Cycle duration at rated capacity for washing & drying cycle (hours/minutes)
Cycle duration at rated capacity for washing cycle (hours/minutes)
Spin drying efficiency class
Airborne acoustic noise emissions (dB(A)) for spinning in "Eco 40-60" Programme and noise emission class


The Evening Star
Juno
Vesta
15760 Albion
Oberon
Taphao Kaew


14:41
Create Plan
SAVE
Select Availability
May 2024
M T W T F S S
1 2 3 4 5 6 7
9 10 11 12 13 14 15
16 17 18 19 20 21 22
23 24 25 26 27 28 29
30 31
Your Goals
Nutrients
Carbohydrates 150gr
Workouts


Laps
30:13:45
Lap 1 02:56:24
Lap 2 02:35:46
Lap 3 01:06:18
Lap 4 04:12:29
Lap 5 02:45:08
Lap 6 05:46:21
Lap 7 03:57:24
Lap 8 02:45:46
Lap 9 03:06:15

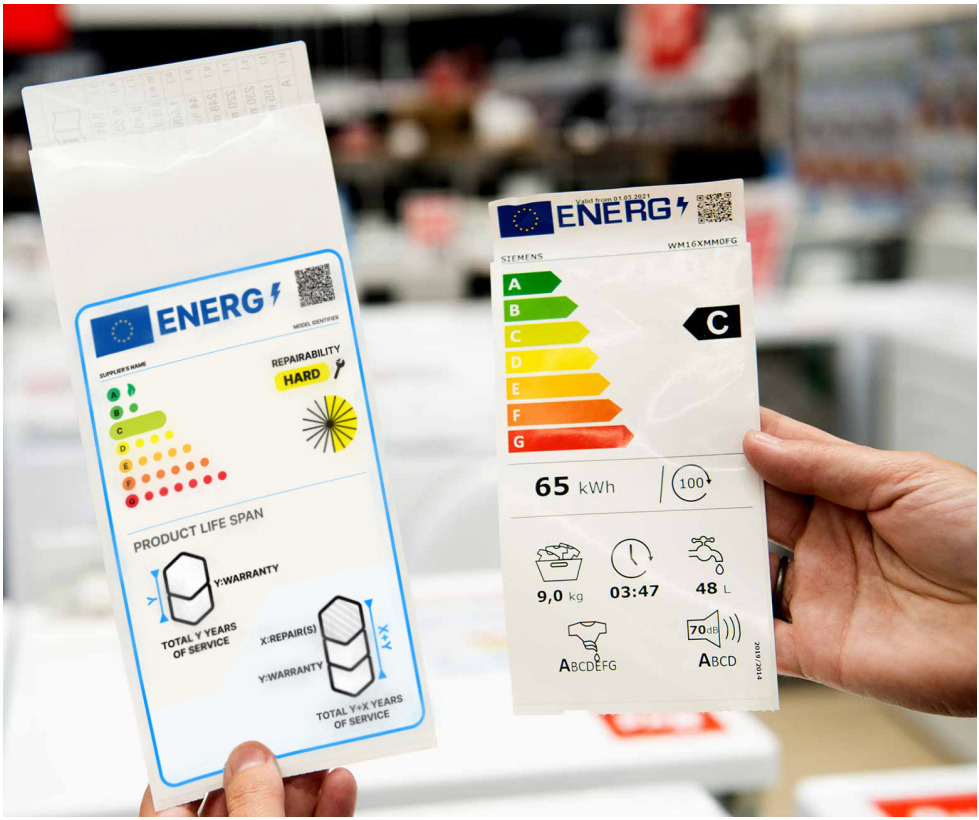
Prototype

With the mood board acting as a starting point, I sketched each component by hand, i.e components showing energy use, repairability and product life span, to get a possible direction for the three different ideas. As for the "energy use"- component, I reused the one currently used in the EU's energy label.Though it serves its current purpose just fine, testers found the representation to be too big. An iteration from this was a bulleted version rather than an acicular representation, which freed up space in the top section of the label.

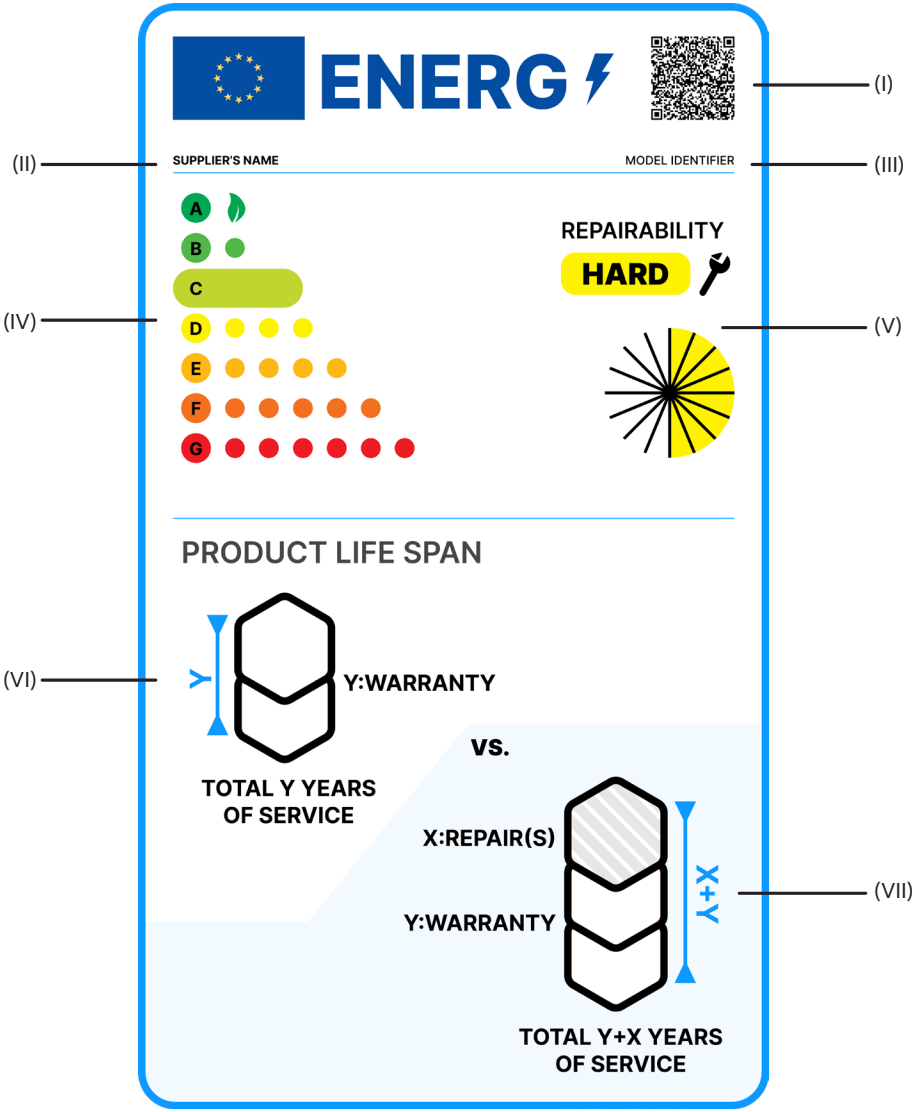
The component describing degree of repairability relied initially on a star form, but this was changed as it didn't properly describe a degree of measurement for the repairability of products. The foreground is still shaped like a star, but serves a way of sectoring the difficulties. In the background is a regular pie chart, which is complemented by a phrase reflecting difficulty: easy; middle; hard.

The trickiest part was the graphical component describing the life span of products. The clue was to display the difference in total product life span between products relying solely on warranty, versus products which have both warranty and underwent repairs. Initially, I experimented with graph representation of trees (data structure), different sizes (where the bigger means greater life span), and a representation of magnitude, i.e. higher stack of cubes means a bigger life span.

Each component was not tested on a user as this activity serves no purpose, since the energy-repairability-label is an interplay between each component. Once I created a first iteration of the label, it was tested on users. After each test I did an iteration before testing it again swiftly - refining the prototype until I got the final version of the label. Given the short time in the end of this project I wished for having more time doing more prototyping and testing. For more sketches, both digital and hand sketches, see appendix C.



An attempt on a possbile scenario for the developd label on left


ENERG
(I)
(II)
SUPPLIER'S NAME
MODEL IDENTIFIER
(III)
A
B
C
D
E
F
G
(IV)
REPAIRABILITY
HARD
(V)
PRODUCT LIFE SPAN
(VI)
Y
Y:WARRANTY
TOTAL Y YEARS
OF SERVICE
VS.
X:REPAIR(S)
Y:WARRANTY
X+Y
(VII)
TOTAL Y+X YEARS
OF SERVICE

Energy Repair Label Specifications

I. Quick Response Code

II. Supplier's Brand or Logo

III. Product Model Number

IV. Energy Efficiency Rating Scale: A (most efficient) to G (least efficient)

V. Difficulty Level: Green (Easy) to Red (Hard)

VI. Warranty-only Product Lifespan

VII. Warranty and Repair Capabability Product Lifespan

Closing Remarks

Defining Obsolescence

Several uses of the term obsolescence: once properly defining the term and its underlying versions/occurrences I think it is easier to have a fruitful discussion and address problems related to obsolescence. Lastly, it is advantageous to focus on a product category since each one might be affected by different versions of obsolescence

Consequences

Consequences of obsolescence were briefly mentioned and were a simplification of how the conditions really are in the real world. For the curious mind, these topics can undoubtedly be examined further, where each topic can be its own project. In this section, problems related to consumption, resource and material depletion and increased amount of e-waste were described to be some of the consequences originating from obsolescence.

Users Tackling Obsolescence

Opposite of obsolescence is defined to be maintenance acts which can counter obsolescence. These involve actions owners can do resulting in emotional bonding, and afterwards, product longevity. I mention three types: preventative, corrective and a progressive repair process. In addition, I talked about some of the effects when owners perform maintenance acts on their possessions, which can result in them keeping it longer. On the contrary, it can also backfire as a result of a failed repair activity, where the possession is rendered unusable and thus prematurely disposed of.

Designers Addressing Obsolescence

Obsolescence can also be addressed from a product designer perspective, where designers can conceptualize and develop either long-life products(resisting obsolescence) or product-life extension (postponing obsolescence)

Addressing Obsolescence on a Systemic Level

From a systemic level, obsolescence is addressed through political work. Organizations, bills and initiatives put demands on manufacturers, companies and commerce to change their current practice and pivot towards a sustainable approach in marketing.

Barriers Related to Product Longevity

Up to this point I have discussed what obsolescence is, effective ways to address this and more. To wrap up the theoretical part of my thesis, I discuss key findings related to barriers to product longevity and the activity of counteracting obsolescence, i.e. barriers to maintenance acts and repair. In the first part of the findings, I divide the different barriers to be related to users, businesses and product development, where I disregard the aspect of business because this is more related to obsolescence in a systemic approach. In the last part of discussing findings, I disclose the "Repair Motivation & Barriers Model", which reduces barriers within users to technical, value and emotional aspects.

Design Intervention

From investigation and doing research on relevant literature about obsolescence, I try to further understand the difficulties in regards to consumers when shopping for new products. I look for clues and highlight design intervention in this particular area. I conduct a workshop from an actual purchase and product emballague and informed purchase turns up. From there I delve into UN's energy efficiency label in home appliances and from this choose to remodel and design a label which can include repairability and estimated/expected product lifetime through warranty. If I had more time, I would have investigated further on the topic about the relationship between warrant and product reliability.

Final Words

I learned that even though it may prove to be complex, the problems related to obsolescence are possible to address.

From an individual user perspective: maintenance acts and other mechanisms enabling emotional bonding with their possessions can help owners in keeping their belongings for an extended time and make the action of discarding a product occasional, rather than frequent. This is true, but there is still a need to look for more design interventions, but this might prove to be too difficult as the problem of obsolescence is systemic.

It is possible for designers to counteract the problem through product development by designing products which either postpone or resist obsolescence, i.e. products which are designed to be disassembled and put together by its owner, being modular or durable - factors and principles that pay attention to product longevity.

In the section about sensemaking and design process I try to depart from this practice since it has already been done. I tried rather to look for design interventions from a customer behavior perspective, and landed on looking for intervention during purchase - the act of acquiring a new product. I learned that customers (potential owners) can be informed about product alternatives and nudged into buying the ones that they can grow emotionally attached to, potentially resulting in long lasting products. What I observed from visits to stores was the opposite - mechanisms such as sale, marketing and information contributing to blurring the judgment of customers in purchase.

References

Bayus, B. L. (1988). Accelerating the durable replacement cycle with marketing mix variables. Journal of Product Innovation Management, 5(3), 216–226. https://doi.org/10.1016/0737-6782(88)90024-0

Bocken, N. M. P., de Pauw, I., Bakker, C., & van der Grinten, B. (2016). Product design and business model strategies for a circular economy. Journal of Industrial and Production Engineering, 33(5), 308–320. https://doi.org/10.1080/21681015.2016.1172124

Chapman, J. (2021a). Meaningful stuff : Design that lasts. The Mit Press.

Chapman, J. (2021b, August 2). Today it's cool, tomorrow it's junk. we have to act against our throwaway culture . The Guardian. https://www.theguardian.com/commentisfree/2021/aug/02/throwaway-culture-products-repair-reuse-recycle-obsolete

Club of Rome, D-mat, IEEP, IGES, Hot or Cool Institute, KR Foundation, ClimateWorks Foundation, & Sitra. (2021). 1.5-Degree lifestyles: Towards A fair consumption space for all. In hotorcool.org. Hot or Cool Institute. https://hotorcool.org/wp-content/uploads/2021/10/Hot_or_Cool_1_5_lifestyles_FULL_REPORT_AND_ANNEX_B.pdf

Cole, C., & Gnanapragasam, A. (2017). Community repair: Enabling repair as part of the movement towards a circular economy. In Nottinham Trent University. y. Nottingham: Nottingham Trent University and the Restart Project. http://irep.ntu.ac.uk/id/eprint/30462

European Commission. (2023, March 22). Press corner. European Commission - European Commission. https://ec.europa.eu/commission/presscorner/detail/en/ip_23_1794

Federal Trade Commission Consumer Advice. (2021, May 13). Extended warranties and service contracts. Consumer Advice. https://consumer.ftc.gov/articles/extended-warranties-service-contracts

Fishman, A., Gandal, N., & Shy, O. (1993). Planned obsolescence as an engine of technological progress. Journal of Industrial Economics, 41(4), 361–370.

Fogg, B. J. (2009, April). A behavior model for persuasive design. Proceedings of the 4th International Conference on Persuasive Technology. Proceedings of the 4th International Conference on Persuasive Technology, California. https://doi.org/10.1145/%201541948.1541999. Fogg, B.J., 2009. A behavior model for persuasive design. Proceedings of the 4th.

Forbrukerrådet. (2021). Forbruk og klimautslipp - befolkningsundersøkelse gjennomført av YouGov for Forbrukerråde. Forbrukerrådet.

Forti, V., Baldé, C. P., Kuehr, R., & Bel, G. (2020). The global e-waste monitor 2020: Quantities, flows and the circular economy potential. United Nations University (UNU)/United Nations Institute for Training and Research (UNITAR) – co-hosted SCYCLE Programme, International Telecommunication Union (ITU) & International Solid Waste Association (ISWA).

Frayling, C. (1994). Research in art and design. Roal College of Art | Research Papers, 1(1). https://antle.iat.sfu.ca/wp-content/uploads/2018/08/Frayling.pdf

Goosink, B. (2020). Graceful Ageing of Products [Master Thesis].

Gregson, N., Metcalfe, A., & Crewe, L. (2009). Practices of object maintenance and repair. Journal of Consumer Culture, 9(2), 248–272. https://doi.org/10.1177/1469540509104376

Guiltinan, J. (2008). Creative destruction and destructive creations: Environmental ethics and planned obsolescence. Journal of Business Ethics, 89(S1), 19–28. https://doi.org/10.1007/s10551-008-9907-9

Haines-Gadd, M., Chapman, J., Lloyd, P., Mason, J., & Aliakseyeu, D. (2018). Emotional durability design nine—a tool for product longevity. Sustainability, 10(6), 1948. https://doi.org/10.3390/su10061948

Jensen, P. B., Laursen, L. N., & Haase, L. M. (2021). Barriers to product longevity: A review of business, product development and user perspectives. Journal of Cleaner Production, 313, 127951. https://doi.org/10.1016/j.jclepro.2021.127951

Keulemans, G., Rubenis, N., & Marks, A. (2017, November). Object therapy: Critical design and methodologies of human research in transformative repair. PLATE | Product Lifetimes and the Environment 2017. PLATE Conference, Delft University of Technology.

Krøger, C. M. N. (n.d.). Produkt historier [Project Thesis].

Kuppelwieser, V. G., Klaus, P., Manthiou, A., & Boujena, O. (2019). Consumer responses to planned obsolescence. Journal of Retailing and Consumer Services, 47, 157–165. https://doi.org/10.1016/j.jretconser.2018.11.014

Lesly Sierra-Fontalvo, González-Quiroga, A., & Mesa, J. A. (2023). A deep dive into addressing obsolescence in product design: A review. Heliyon, 9(11), e21856–e21856. https://doi.org/10.1016/j.heliyon.2023.e21856

Longmuss, J., & Poppe, E. (2017). Planned obsolescence: Who are those planners? PLATE: Product Lifetimes and the Environment, 9, 217–221. https://doi.org/10.3233/978-1-61499-820-4-217

Magazine, S., & Matchar, E. (2016, June 13). The fight for the "right to repair." Smithsonian Magazine. https://www.smithsonianmag.com/innovation/fight-right-repair-180959764/#f-7D6EbUdOyRPt6VX.99

Magee, C. L., & Devezas, T. C. (2017). A simple extension of dematerialization theory: Incorporation of technical progress and the rebound effect. Technological Forecasting and Social Change, 117, 196–205. https://doi.org/10.1016/j.techfore.2016.12.001

Marcus, J. S., & Policy Department for Economic, Scientific and Quality of Life Policies. (2020). Promoting product longevity (C. Racliff & R. Bianchini, Eds.; pp. 1–46). Study for the Committee on Committee on the Internal Market and Consumer Protection, Policy Department for Economic, Scientific and Quality of Life Policies, European Parliament.

Martin, B., & Hanington, B. M. (2019). Universal methods of design : 100 ways to research complex problems, develop innovative ideas, and design effective solutions. Rockport Publishers. (Original work published 2012)

McKinsey & Company. (2022, August 17). What is iot: The internet of things explained | mckinsey. www.mckinsey.com; McKinsey & Company. https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-is-the-internet-of-things

Mellal, M. A. (2020). Obsolescence – A review of the literature. Technology in Society, 63, 101347. https://doi.org/10.1016/j.techsoc.2020.101347

Miljødirektoratet. (n.d.). EE-avfall. Miljøstatus; Miljødirektoratet. Retrieved March 8, 2024, from https://miljostatus.miljodirektoratet.no/tema/avfall/ee-avfall/

Mugge, R., Schoormans, J. P. L., & Schifferstein, H. N. J. (2009). Emotional bonding with personalised products. Journal of Engineering Design, 20(5), 467–476. https://doi.org/10.1080/09544820802698550

Nazlı, T. (2020). Repair motivation and barriers model: Investigating user perspectives related to product repair towards a circular economy. Journal of Cleaner Production, 289, 125644. https://doi.org/10.1016/j.jclepro.2020.125644

Nordic Swan Ecolabel. (n.d.). Official nordic ecolabel. Www.nordic-Swan-Ecolabel.org. Retrieved April 11, 2024, from https://www.nordic-swan-ecolabel.org/official-nordic-ecolabel/

Norsirk, Renas, Recipo, & ERP Norge. (n.d.). EE-avfall på avveie (J. Brenna, Ed.).

Norton, M. I., Mochon, D., & Ariely, D. (2012). The IKEA effect: When labor leads to love. Journal of Consumer Psychology, 22(3), 453–460. https://doi.org/10.1016/j.jcps.2011.08.002

O'Reilly. (2015). Will planned obsolescence kill silicon valley? - Rob Coneybeer [Video]. In www.youtube.com. https://www.youtube.com/watch?v=fQQtMqUffzU&list=PL0ltCPB9E-ELbtL-cORbN-3M9AiMe2ZqH9&index=3

Oxford English Dictionary. (2024). Obsolescence. In Oxford English Dictionary. Oxford UP. https://doi.org/10.1093/OED/8808898642

LOI n° 2015-992 du 17 août 2015 relative à la transition énergétique pour la croissance verte (1), no. 2015-992 (2015). https://www.legifrance.gouv.fr/jorf/article_jo/JORFARTI000031044819

Remy, C., & Huang, E. M. (2014). Addressing the obsolescence of end-user devices: Approaches from the field of sustainable HCI. In L. M. Hilty & B. Aebischer (Eds.), Advances in Intelligent Systems and Computing (Vol. 310, pp. 257–267). Springer International Publishing Switzerland 2015.

Sheibani, A. (2014, March 26). Rare earth metals: Tech manufacturers must think again, and so must users. The Guardian; The Guardian. https://www.theguardian.com/sustainable-business/rare-earth-metals-upgrade-recycle-ethical-china

Thunberg, G. (2022). The climate book. Allen Lane.

United Nations University, & Step Initiative 2014. (2014). Solving the e-waste problem (step) white paper one global definition of e-waste. https://collections.unu.edu/eserv/UNU:6120/step_one_global_definition_amended.pdf

Valant, J. (2016). Planned obsolescence: Exploring the issue. EPRS | European Parliamentary Research Service.

van Nes, N., & Cramer, J. (2005). Influencing product lifetime through product design. Business Strategy and the Environment, 14(5), 286–299. https://doi.org/10.1002/bse.491

World Economic Forum. (n.d.). Strategic intelligence | World Economic Forum. Stategic Intelligence; World Ecnonomic Forum. Retrieved March 7, 2024, from https://intelligence.weforum.org/topics/a1Gb0000000pTDhEAM/key-issues/a1Gb0000004cCGFEA2

World Health Organization. (2023, October 18). Electronic Waste (e-waste). World Health Organization. https://www.who.int/news-room/fact-sheets/detail/electronic-waste-(e-waste)

OpenAI. (2024). ChatGPT 3.5 (May 2 version) [Large language model]. https://chat.openai.com/chat

Figures

Images

Image 1. Core77. (2013b). KF 20 - florian seiffert(Braun, 1972) [Online Image]. In Core77. https://s3files.core77.com/blog/images/2013/05/Braun-1972-KF-20.jpg

Image 2. Core77. (2013a). HE 1/12 - reinhold weiss(Braun, 1961) [Online Image]. In Core77. https://s3files.core77.com/blog/images/2013/05/Braun-1961-HE1.jpg

Image 3. reddot design award. (n.d.). Haier kitchen appliance - red dot design awards [Online Image]. In reddot design awards.

Image 4. Adelman, B. (1964). Warhol in an N.Y.C supermarket [Photograph]. In Vanity Fair (Ed.), Vanity Fair. https://artscapy.s3.amazonaws.com/bx_posts_photos/x/xk/xks/xk s5tg7sekugwwcuhenecddh4qjbpsrw.png

Image 5. Burtynsky, E., & Flowers Gallery London. (2015). Coal mine #1, North Rhine, Westphalia, Germany, 2015 [Online Image]. In The Guardian. https://i.guim co.uk/img/media/603e0fcf79e746a6cc8c841460d3e81 4f930d5b/0_0_2000_1499/master/2000.jpg?width=880&quality=45&auto=fo mat&fit=max&dpr=2&s=edc1e7c482a3e274331ba916270aac85

Image 6. Becker, O. O. (n.d.). E-waste and Waste [Online Image]. Retrieved April 23, 2024, from https://images.fastcompany.com/image/upload/fc/olaf-otto-becker-21.webp

Image 7. Dodzy, B., & Unsplash. (2020). Woman in red jacket standing near green and white plastic crates [Online Image]. In Unsplash. https://unsplash.com/photos/woman-in red-jacket-standing-near-green-and-white-plastic-crates-t4xqgMuudlw

Image 8. Vanyi, D., & Unsplash. (2018). photography of excavators at mining area [Online Image]. In Unsplash. photography of excavators at mining area

Image 9. Pcmag. (n.d.). Man walking next to a pile of e-waste [Online Image]. In pcmag. Retrieved April 23, 2024, from https://i.pcmag.com/imagery/articles/04801E3UVtxDTDY9e 1ovu0-12..v1618516314.jpg

Image 10. BBC Travel. (n.d.). From kintsugi to tsuiki: Lessons from japanese craft ma ters [Online Article]. In BBC Travel. Retrieved April 23, 2024, from https://ychef.files bbci.co.uk/1920x960/p0dj5c0j.jpeg

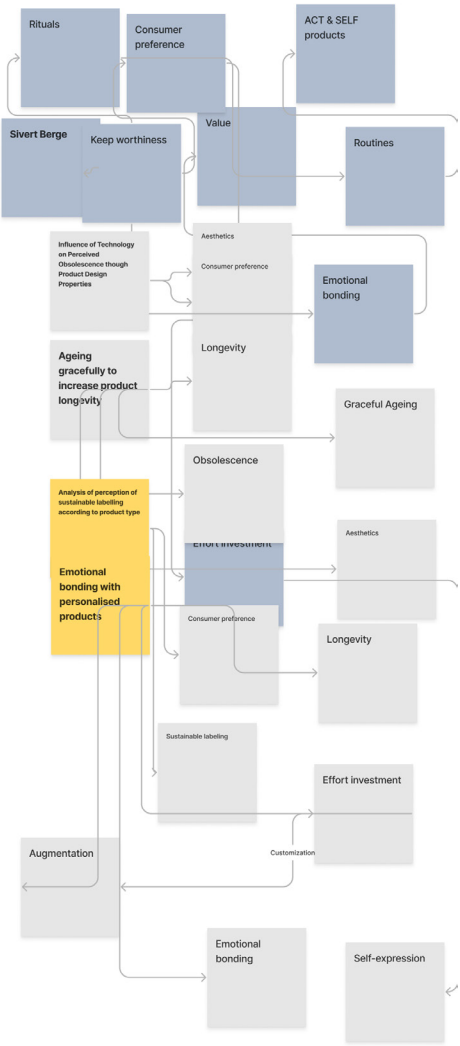
Image 11. Marquez, J. (2019). Instead of hiding rips and tears, the visible mending mov ment turns them into art [Online Image]. In M. Racklin & Vox (Eds.), Vox. https://cdn vox-cdn.com/thumbor/tJO02T8E0OtkmHXVmKB48RF-KA=/0x0:2000x2000/1520x1013/filters:focal(877x1061:1197x1381):fo mat(webp)/cdn.vox-cdn.com/uploads/chorus_image/image/63282239/jessica marquez_sashiko_mending_2918.0.jpg

Image 12. Cale, B. (n.d.). Top 10 Learning & Development Conferences of 2023 [Online Illustration]. In Dribble. Retrieved April 23, 2024, from https://cdn.dribbble com/userupload/4717193/file/original-8b9ea2ce1bc858e46f56dd5e207e0d68.j g?resize=1200x900

Appendix

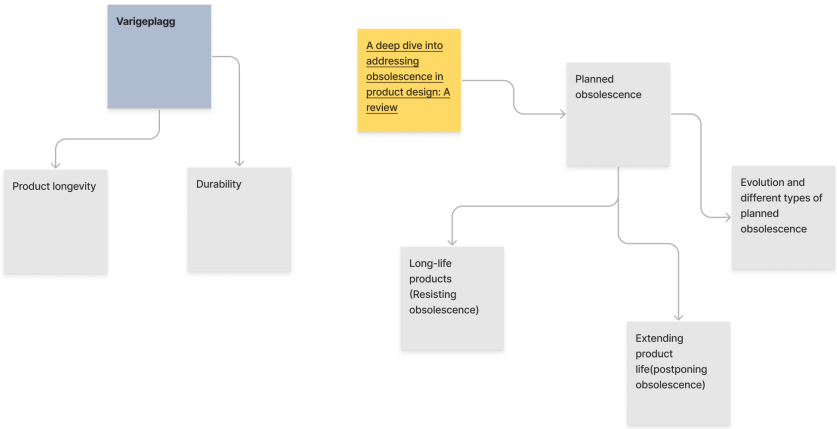
Appendix A

EXPERIMENTS/PHYSICAL STUDIES

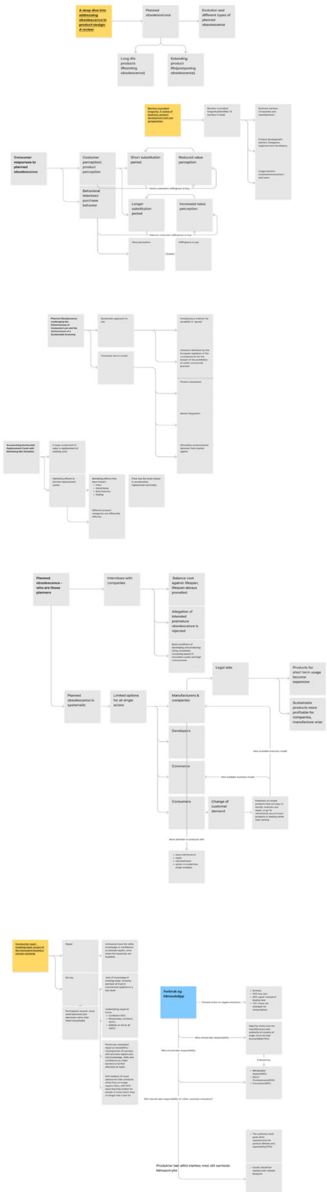


FRAMEWORK

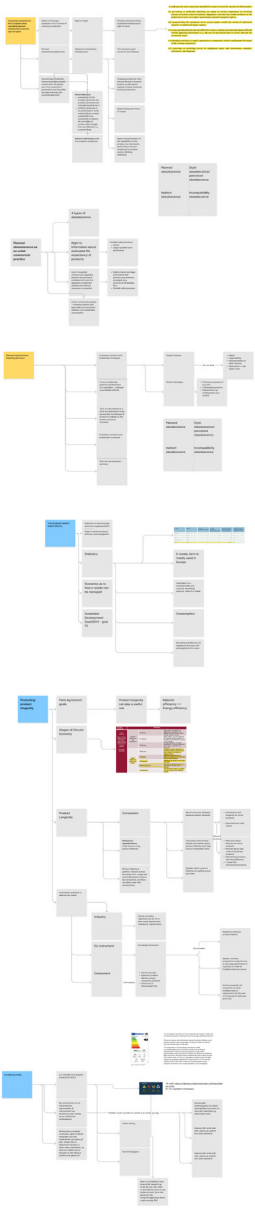
METHODS


Varigeplagg
Product longevity
Durability
A deep dive into addressing obsolescence in product design: A review
Planned obsolescence
Evolution and different types of planned obsolescence
Long-life products (Resisting obsolescence)
Extending product life(postponing obsolescence)

RESEARCH 1/2

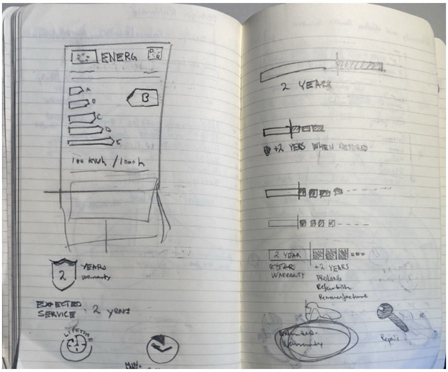

Planned obsolescence
Evolution and different types of planned obsolescence
Long-life products (Resisting obsolescence)
Extending product life(postponing obsolescence)
Consumer responses to planned obsolescence
Costumer perception/ product perception
Short substitution period
Reduced value perception
Behavioral intention/ purchase behavior
Longer substitution period
Increased value perception
Planned obsolescence - who are these planners
Interviews with companies
Balance cost against lifespan, lifespan always prevalent
Allegation of intended premature obsolescence is rejected
Legal side
Products for short term usage become expensive
Sustainable products more profitable for companies, manufacture wise
Planned obsolescence is systematic
Limited options for all single actors
Manufacturers & companies
Developers
Commerce
Consumers
Change of customer demand
Forbruk og klimautslipp
Produkter bør alltid merkes med sitt samlede klimaavtrykk

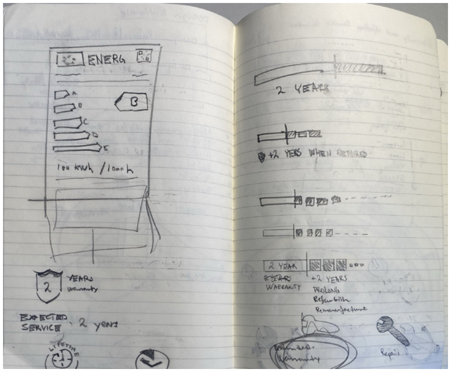
RESEARCH 2/2

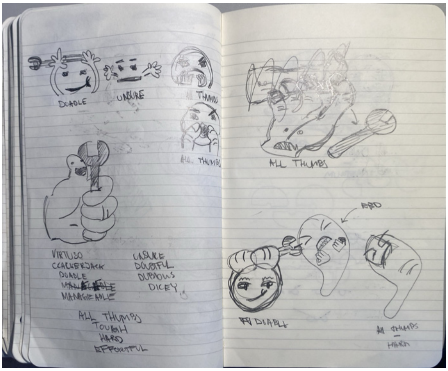


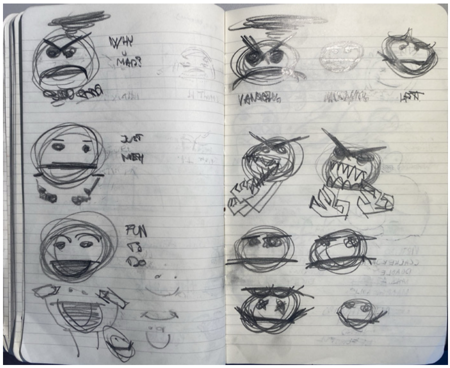
Appendix B

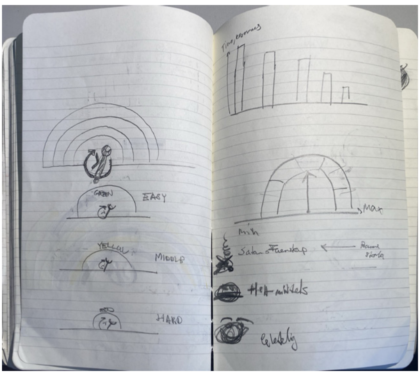
Appendix C

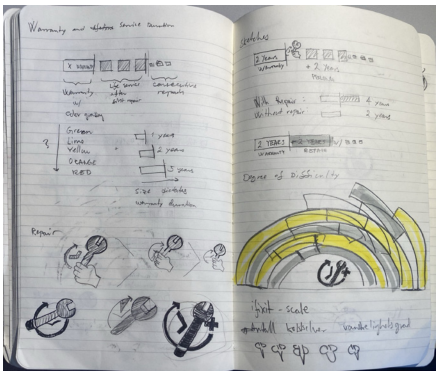

ENERG
2 YEARS
+2 YEARS WHEN REPAIRED
2 YEAR
+2 YEARS
YEARS warranty
EXPECTED SERVICE
2 years
Repair

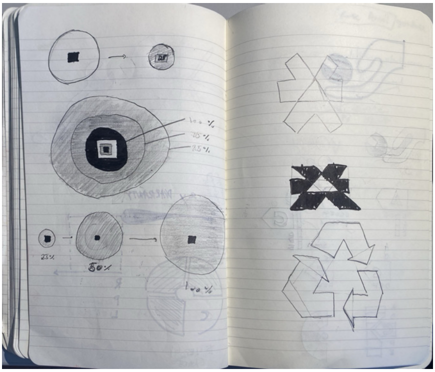

ENERG
2 YEARS
+2 YEARS WHEN REPAIRED
2 YEAR
+2 YEARS
YEARS warranty
EXPECTED SERVICE
2 years
Repair

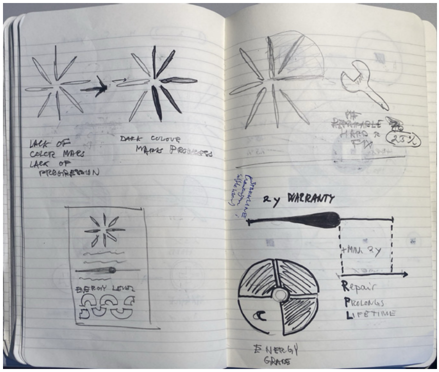

DOABLE
UNSURE
ALL THUMBS
VIRTUSO
CRACKERJACK
DOABLE
MANAGEABLE
UNSURE
DOUBTFUL
DUBIOUS
DICEY
ALL THUMBS
TOUGH
HARD
EFFORTFUL
DIABLE

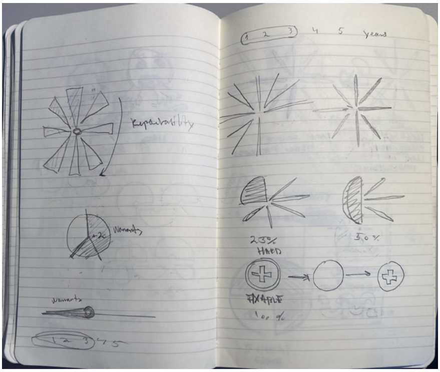

WHY
JUST
MEH
FUN
TO
DO

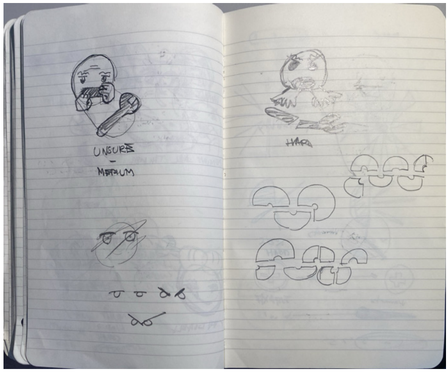

GREEN
EASY
YELLOW
MIDDLE
HARD
Max
Min

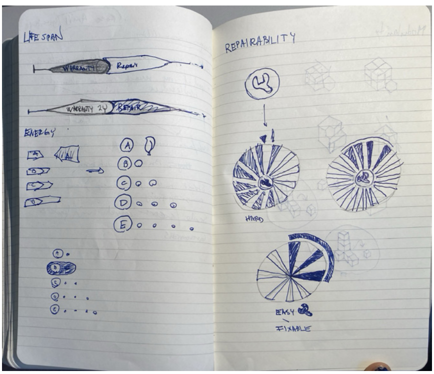

Green
Lime
Yellow
ORANGE
RED
2 YEARS
Degree of Difficulty
Repair
ifixit - scale

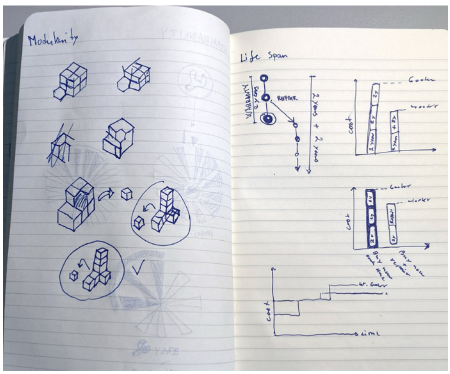



LACK OF COLOR MAKES LACK OF PROGRESSION
DARK COLOUR MAKES PROGRESS
2y WARRANTY
Repair Prolongs Lifetime
ENERGY GRADE

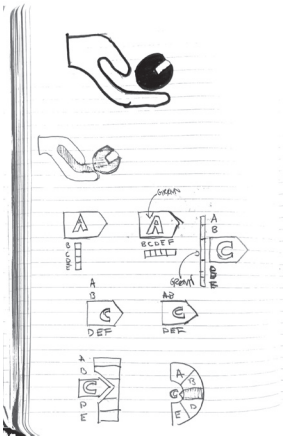

Repairability
years
25% HARD
50%
FIXABLE

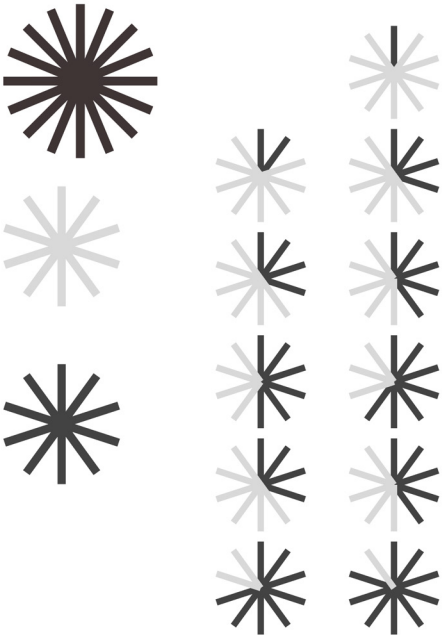

UNSURE
MEDIUM
HARD


LIFE SPAN
REPAIRABILITY
ENERGY
HARD
EASY FIXABLE


Modularity
Life Span

REPAIRABILITY





REPAIRABILITY

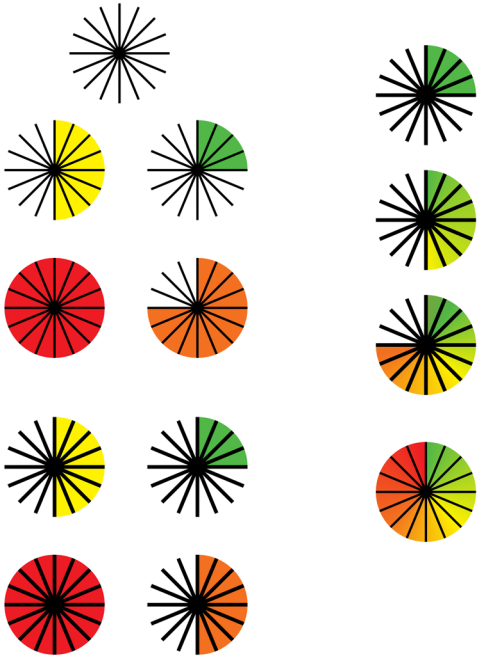
EASY

REPAIRABILITY

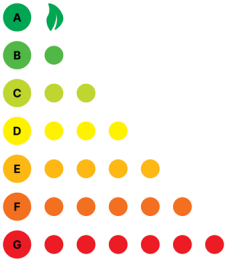
MEAN

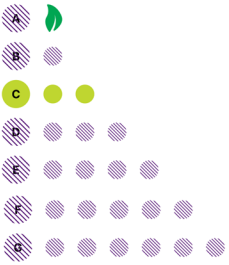
REPAIRABILITY

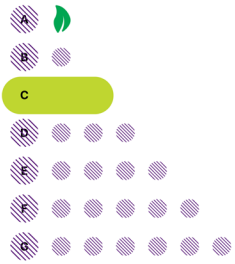
HARD

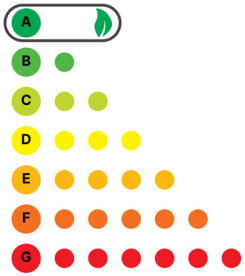


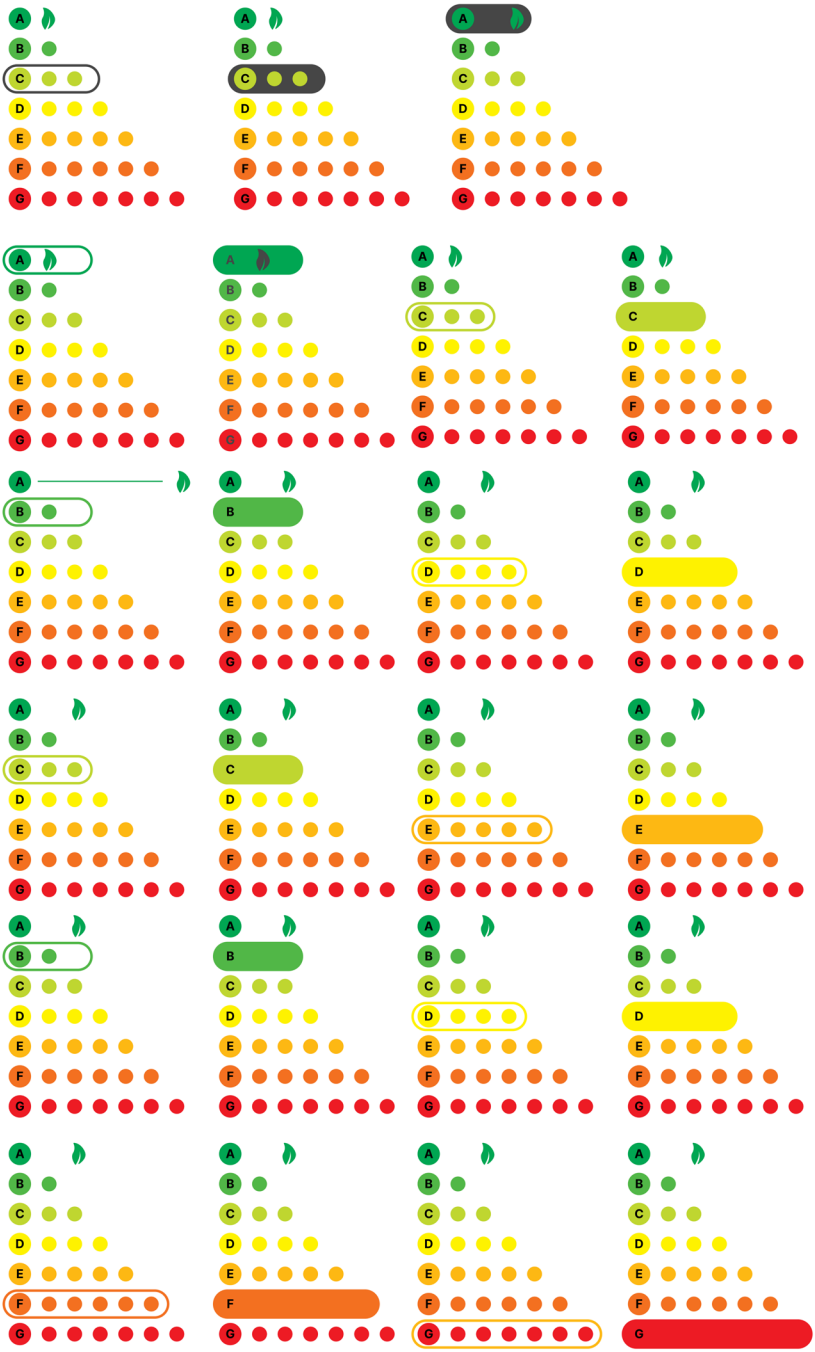
ENERGY



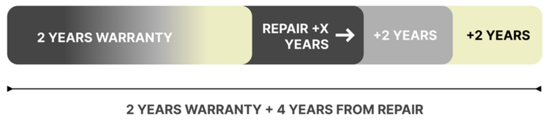


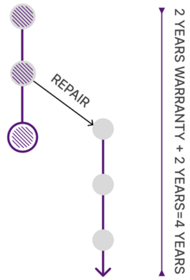


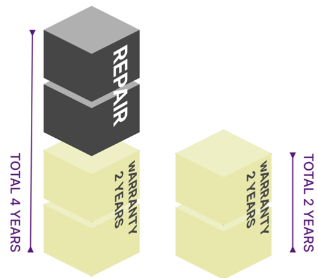



A
B
C
D
E
F
G

LIFE SPAN

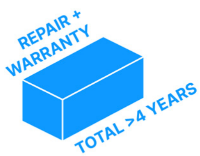

2 YEARS WARRANTY
REPAIR +X YEARS
+2 YEARS
+2 YEARS
2 YEARS WARRANTY + 4 YEARS FROM REPAIR


REPAIR
2 YEARS WARRANTY + 2 YEARS=4 YEARS


REPAIR
WARRANTY 2 YEARS
TOTAL 4 YEARS
WARRANTY 2 YEARS
TOTAL 2 YEARS


REPAIR + WARRANTY
TOTAL >4 YEARS


WARRANTY
TOTAL 2 YEARS

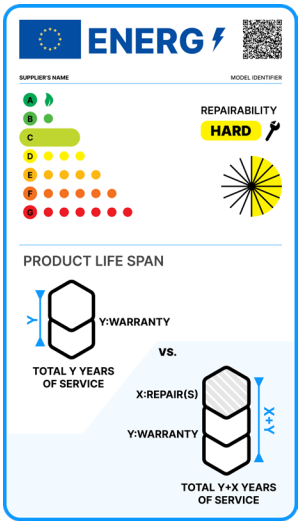

REPAIR + WARRANTY
TOTAL >4 YEARS

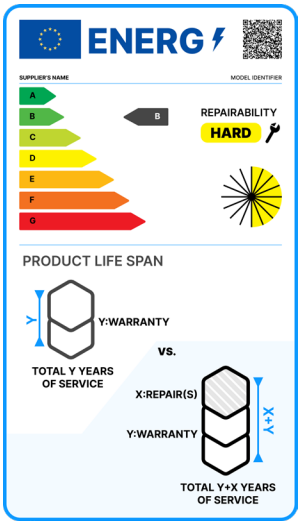

WARRANTY
TOTAL 2 YEARS

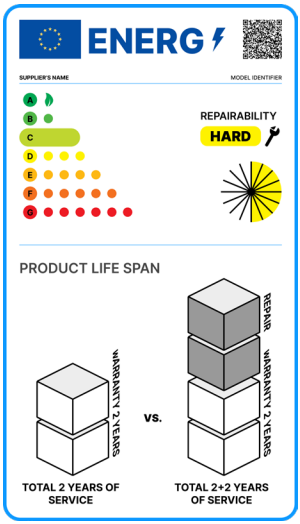

REPAIR + WARRANTY
TOTAL >4 YEARS

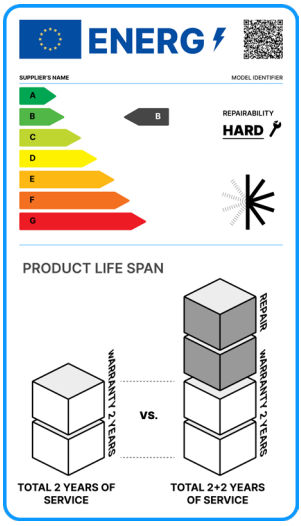

WARRANTY
TOTAL 2 YEARS

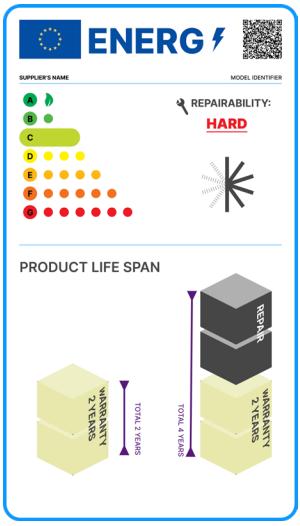
ENERGY AND REPAIRABILITY LABEL

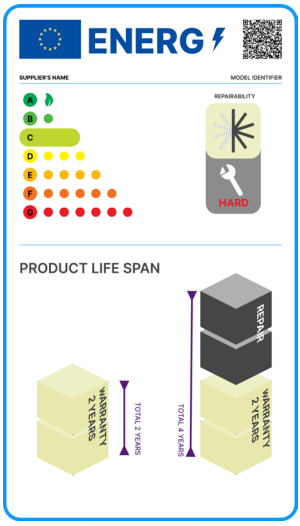


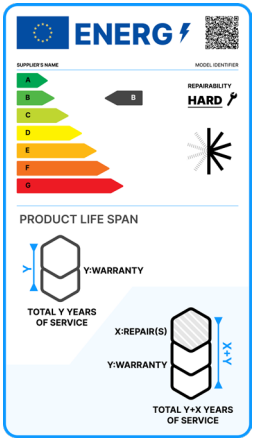


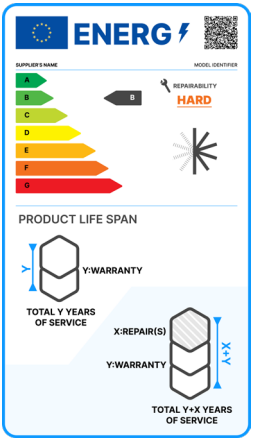









ENERG
SUPPLIER'S NAME
MODEL IDENTIFIER
A
B
C
D
E
F
G
B
REPAIRABILITY
HARD
PRODUCT LIFE SPAN
Y
Y:WARRANTY
TOTAL Y YEARS
OF SERVICE
X:REPAIR(S)
Y:WARRANTY
X+Y
TOTAL Y+X YEARS
OF SERVICE


ENERG
SUPPLIER'S NAME
MODEL IDENTIFIER
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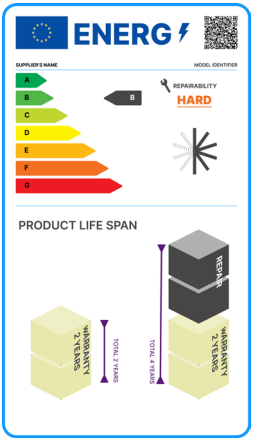
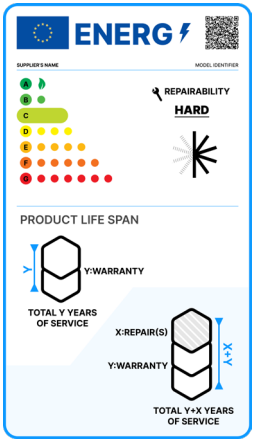
REPAIRABILITY
HARD
PRODUCT LIFE SPAN
Y
Y:WARRANTY
TOTAL Y YEARS
OF SERVICE
X:REPAIR(S)
Y:WARRANTY
X+Y
TOTAL Y+X YEARS
OF SERVICE


ENERG
SUPPLIER'S NAME
MODEL IDENTIFIER
A
B
C
D
E
F
G
B
REPAIRABILITY
HARD
PRODUCT LIFE SPAN
REPAIR
WARRANTY
2 YEARS
TOTAL 2 YEARS
TOTAL 4 YEARS
WARRANTY
2 YEARS


ENERG
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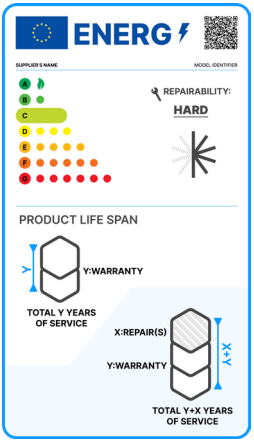
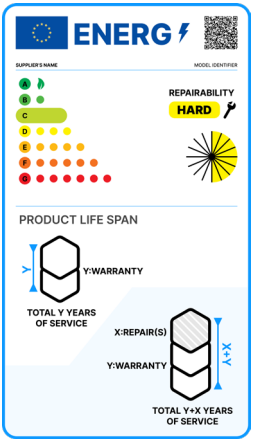
D
E
F
G
REPAIRABILITY
HARD
PRODUCT LIFE SPAN
Y
Y:WARRANTY
TOTAL Y YEARS
OF SERVICE
X:REPAIR(S)
Y:WARRANTY
X+Y
TOTAL Y+X YEARS
OF SERVICE


ENERG
SUPPLIER'S NAME
MODEL IDENTIFIER
A
B
C
D
E
F
G
REPAIRABILITY:
HARD
PRODUCT LIFE SPAN
Y
Y:WARRANTY
TOTAL Y YEARS
OF SERVICE
X:REPAIR(S)
Y:WARRANTY
X+Y
TOTAL Y+X YEARS
OF SERVICE


ENERG
SUPPLIER'S NAME
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REPAIRABILITY
HARD
PRODUCT LIFE SPAN
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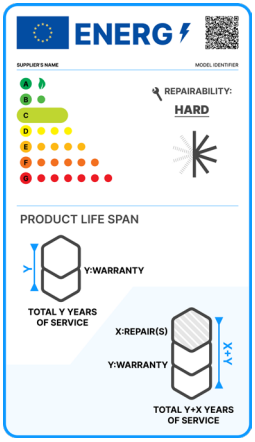
Y:WARRANTY
TOTAL Y YEARS
OF SERVICE
X:REPAIR(S)
Y:WARRANTY
X+Y
TOTAL Y+X YEARS
OF SERVICE


ENERG
SUPPLIER'S NAME
MODEL IDENTIFIER
A
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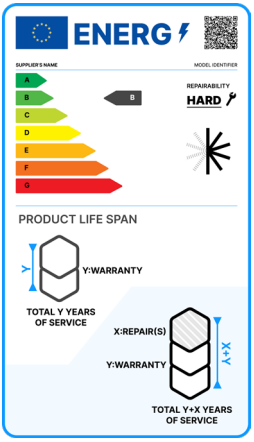
C
D
E
F
G
REPAIRABILITY:
HARD
PRODUCT LIFE SPAN
Y
Y:WARRANTY
TOTAL Y YEARS
OF SERVICE
X:REPAIR(S)
Y:WARRANTY
X+Y
TOTAL Y+X YEARS
OF SERVICE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REPAIRABILITY
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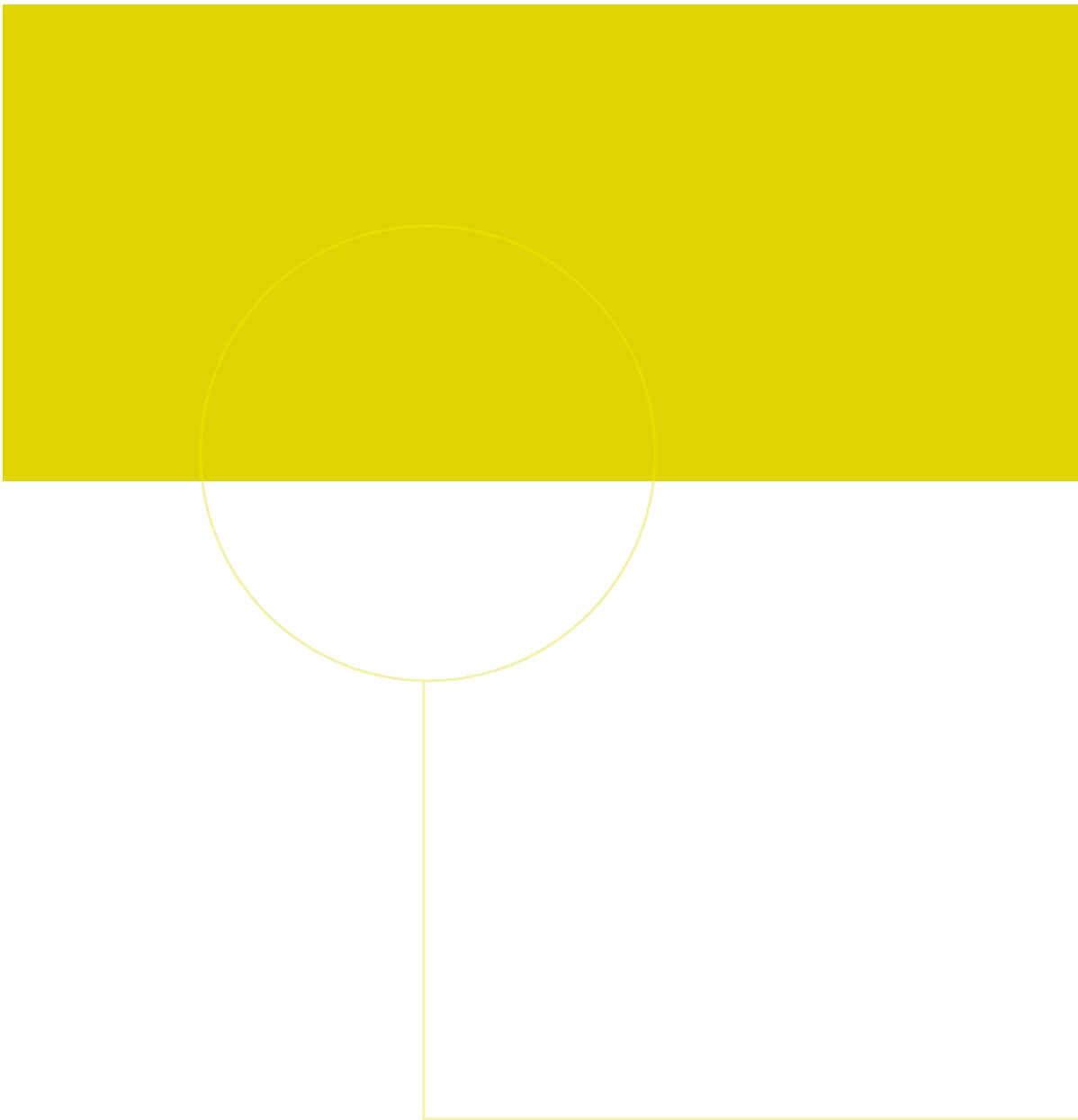
TOTAL Y+X YEARS
OF SERVICE



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